ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E.
General Editor: J. H. COSENS
Technical Editor: P. W. TUCKER, M.I.E.E.

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ELECTRICAL REVIEW

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B.I.F. and Export

EXHORTATIONS to manufacturers to export as much of their production as possible have been so frequent in the past twenty years or so that to export has become second nature to most of the leading members of British industry. No section has made greater endeavours in this respect than the electrical industry which, from a mere £24 million in 1938, raised the total value of its direct exports to £212 million last year. With indirect exports the figure was £250 million—about a third of the industry's total production.

It has to be said, though, that the 1953 total was lower than that of the preceding year. This may have been due to a small extent to lower prices, but the principal reasons were the import policy of some of Great Britain's leading customers (sometimes of a protective character) and the strengthening of foreign competition. While it is possible that import restrictions may be relaxed, it is certain that the competition from other industrial nations will grow and the only hope of maintaining our position lies in expanding markets. Such expansion may be natural growth but without stimulation and cultivation it may be very slow.

Consequently, it has become more necessary than ever for British electrical manufacturers to take an active part in overseas developments by initiating schemes or by assisting to expedite projects which are already contemplated. Primarily this means the frequent visiting of the countries concerned by principals armed with technical and commercial knowledge and able to make authoritative offers. It is pleasing to learn, with increasing frequency, of leaders of the electrical industry who are making personal contacts with important potential customers all over the world, with evident results.

Although it is easier for manufacturers to go to overseas customers than to persuade them to come to this country a two-way traffic is advantageous. In its origins the British Industries Fair was designed to induce buyers to come to Britain to secure a comprehensive view of what this country has to offer. Although there has been a tendency in recent years for the Fair to be regarded as being as much for the benefit of the home buyer, it is still able to attract people from abroad and it remains the only British counterpart of the large Continental trade fairs.

There has been a falling-off in electrical support for the Fair. No doubt some of the leading concerns in the industry have had good reasons for withdrawing but we cannot help regretting their decision. While the Fair lasts we want to see the Electrical Section fully representative, as we think that the second largest exporting industry should not be compared unfavourably either with other sections of British industry or with the electrical industries of other countries.

A GOOD RECORD

Reflecting the size, importance and variety of the electrical industry, the report for 1953–54 of the British Electrical and Allied Manufacturers' Association (reviewed in this issue) is a record of an amazing amount of work in many different fields. It is not too much to say that in one respect, in this electrical age, B.E.A.M.A. members keep the country going. They also contribute very substantially to our export trade. Last year the total value of electrical exports was over £250 million (including indirect exports). Turbo-generator plant to the extent of 2,500 MW was manufactured last year, nearly 25 per cent above the 1952 output. The Association claims that its members are able not only to satisfy overseas demands for their generating plant but also to produce 2,000 MW a year for the home electricity supply industry. It is again maintained that nothing short of that figure will be enough to enable the growing demand for electricity to be met. That demand arises from industry and from the domestic consumer. No longer officially frowned upon, domestic electrical development is not only good for the public, it benefits the British Electricity Authority by improving its load factor. Additionally it helps in expanding overseas trade, for a sound home market for domestic appliances is a necessary basis for export business.

EAST-WEST TRADE

Although in some quarters there is a tendency to belittle the importance of trade between this country on the one hand and Russia and its associates, including China, on the other, this is not the view of the B.E.A.M.A. Council which considers that the electrical industry is vitally concerned in developing trading facilities with these nations. At present the ban on exports to China (embracing most types of electrical machinery) imposed during the Korean war is still in force. Its removal depends largely upon the outcome of the conference on Korea and Indo-China being held in Geneva. In the meantime there have been talks in Berlin between a group of British business men and representatives of the China National Import-Export Corporation which has expressed a desire to do business with this country. Trade with Russia, upon which there are also limitations, awaits Governmental decisions. Last week about 150 experts met in Geneva under the auspices of the Economic Commission for Europe and discussed methods of extending East–West trade, paying particular attention to the nature of the goods and terms of trade.

PORTABLE TOOLS

Although transportable electrical apparatus which is heavy enough to require wheeling from one point to another has normally to be supplied at mains voltage to avoid the use of impracticably large flexible connections, it is normally safer than smaller portable appliances since any shock risk is likely to be one of momentary contact only. Portable appliances, however, which are usually gripped when the supply is switched on, can, and should, be supplied at a lower voltage, such as 110 V with the mid-point of the transformer earthed. Even 55 V to earth is not always low enough and there appears to be every justification for the view expressed by Mr. J. W. Bunting in his I.E.E. paper, the discussion on which is reported in this issue, that 12½ V handlamps should be used in hazardous cases as the current flow through the body would probably then be insufficient to cause serious muscular contraction. It is ability to transform to safe voltages that makes alternating current safer than direct current, despite its higher peak voltage.

IMPROVING LOAD FACTOR

Load factor improvement has been a controversial question of first importance right from the earliest days of the electricity supply industry. Since that industry was first put on a national footing with the establishment of the Central Electricity Board and the grid round about 1926, there has been a marked gradual improvement in the load factor for the public supply of the whole country mainly, no doubt, on account of the diversity of the domestic load which has been a progressive development over practically the whole of that time. The grid load factor is still only around the 50 per cent mark however—49·2 per cent in 1952 53 against about 47 per cent in 1947—and the possible reward for still further increase is so promising that we wonder if all that it is possible to do has yet been done. The two greatest possibilities in this matter appear to be the further spreading of industrial working over the twenty-four hours and the encouragement of full-time space heating. The former possible remedy has been tried and has met with opposition from political and trade union interests, while during the war and immediate post-war period full-time electric domestic space heating experienced a severe setback as the result of the false picture gained by the public through load shedding. But the industry must not let these matters rest.

ELECTRICIANS' WAGES AWARD

So far we have not seen any "official" comment by the Electrical Trades Union upon the award of ½d an hour to journeymen electricians in the electrical contracting industry by the Industrial Disputes Tribunal. We note a remark, however, in the Union's April journal to the effect that, with the reference of the dispute to the Tribunal, "arbitration as a method of settling disputes on the merits of the case is on trial, because we understand the incontrovertible justification of our claim." Setting aside the facts that the amount of the claim was not specified and that an increase of 2d an hour had already been conceded by the employers, this statement seems to mean that unless the Tribunal gave a decision in the Union's favour arbitration as a method of settling disputes was damned. In the event the Tribunal's award was in the Union's favour but whether the amount was large enough to establish the Union's faith in arbitration is not known. The Tribunal stated in its award that it had given careful consideration to the statements and submissions of the two parties and had "taken note" of the 2d an hour already granted; but in awarding the additional ½d it did not give its reasons, which would have been of general interest.

British Industries Fair

STAND-BY-STAND PREVIEW OF ELECTRICAL AND ALLIED EXHIBITS

NEARLY four hundred of the exhibitors at the thirty-third British Industries Fair, which from next Monday until Friday, 14th May, is being held at Castle Bromwich, Birmingham, and Olympia and Earls Court, London, are showing items of electrical interest. Over three hundred of them are at Castle Bromwich where the Engineering Section is held and although these are largely concentrated in the Electrical Section (C), there are many distributed around the other three sections, Hardware (A), Building (B) and Engineering (D). Several names conspicuous for many years will be found to be missing from this year's display, but the fact that their places have been taken by manufacturers whose products are perhaps not so well known is likely to infuse new interest.

Exhibits in London

Of the sixty or so electrical exhibitors in London those showing lighting fittings, clocks, instruments, office equipment, electromedical apparatus and certain domestic appliances are to be found at Olympia. Some vacuum cleaners, plastic materials and mouldings, and various appliances associated with the textile industry are displayed at Earls Court where there are also two special features, one showing the part played by British manufacturers in the conquest of Mount Everest and the other, arranged by the Council of Industrial Design in association with the Board of Trade, a Design Centre including an attractive display of up-to-date domestic electrical appliances and lighting fittings.

Once again the *Electrical Review* occupies stand C.616 in a prominent position in the Electrical Section at Birmingham and representatives from all departments will be available to give every assistance possible to visitors in any matter relating not only to the exhibition but to the electrical industry generally. The telephone number of the stand is Fair 533.

Available free from the *Electrical Review* stand is a comprehensive list of exhibitors of electrical and allied goods which has been printed in the form of a folder, with a considerable amount of general information prepared by the B.I.F. Electrical Exhibitors' Committee, to form a guide, which will be of assistance both to exhibitors and also to visitors.

The "Electrical Day," on which various electrical organizations pay their official visits to Castle Bromwich, is again arranged for the second Tuesday, 11th May. The dates of visits of Royalty and other important persons have yet to be announced.

Trade buyers are admitted to all sections of the Fair every weekday from 9.30 a.m. to 6 p.m. except on the last day when the closing hour will be 4 p.m. Overseas buyers are admitted free; home buyers can for 5s obtain badges which will admit them to all sections throughout the duration of the Fair. Day tickets cost 2s 6d for each section. The public is admitted each day after 2 p.m. and all day on Saturday, 8th May, for 2s 6d for each building. On the Saturday organized parties of twenty or more will be admitted for 1s 6d per head.

Travelling Facilities

Special train services will run from New Street, Birmingham, to Castle Bromwich and there will be through trains daily (except Saturday) from London to Castle Bromwich, leaving Euston at 8.37 a.m. (third class) and 9 a.m. (first class) and returning at 6.15 p.m. and 6.5 p.m. On the closing day, Friday, 14th May, a combined first and third class train will depart from Euston at 9 a.m. and return at 4.15 p.m.

During the Fair period motor buses will leave the Birmingham Chamber of Commerce offices, 95, New Street (Ethel Street corner) every few minutes from 8.30 a.m. as required. A special bus will meet the London train arriving at Snow Hill in the mid morning. A daily air service leaves Croydon at 9.45 a.m. and returns at 5 p.m. The journey takes an hour in each direction and costs £5 18s.

EXHIBITS AT BIRMINGHAM

A.E.R. (1938), Ltd., 196, Great Cambridge Road, Enfield. **D.720.**—High vacuum metal coatings for scientific and decorative purposes; also electroplating on zinc base diecastings and aluminium fabrications.

Accles & Shelvoke, Ltd., Talford Street Works, Aston, Birmingham, 6. **D.323.**—"Acvoke" cable spiking guns provide a safe means of testing high voltage armoured and other cables before service work.

Acme Wringers, Ltd., David Street, Glasgow, S.E. **A.415.**—Power operated clothes wringers.

Aeraspray Associated, Ltd., 179–213, Thimble Mill Lane, Birmingham, 7. **D.734.**—Spray painting equipment includes portable and stationary air compressor sets from ½ h.p. to 10 h.p. and a typical water wash spray booth.

Aerograph Co., Ltd., Lower Sydenham, London, S.E.26. **D.509.**—Spraying plant, compressors, etc.

Aeronautical & General Instruments, Ltd., Purley Way, Croydon. **D.121.**—Of special interest among the "Neville" range of coil winding machines are the "Pretoria" bench or table mounted automatic model embodying a special foot operated clutch, the "Hamilton" hand machine, the "Edinburgh" automatic wave-winding units winding four or more coils simultaneously, and the "Winnipeg" hand wave-winding machine.

Airscrew Co. & Jicwood, Ltd., Weybridge. **D.726.**—Axial, centrifugal and blower fans range from window units to cooling tower fans.

Aiton & Co., Ltd., Derby. **D.608.**—A sectioned end of a 30in bore steam receiver, intended for service at 650 lb/sq in, 850 deg F, is fitted with a 3½in bore auxiliary steam branch and drain vessel to illustrate the latest requirements of the British Electricity Authority to combat corrosion fatigue. "Corwel" joints are utilized for this connection. An austenitic steel steam pipe, evaporator distilling plant, bellows expansion joints, and steam traps are other items.

Albright & Wilson, Ltd., 49, Park Lane, London, W.1. **C.617/516.**—This display in a showcase is devoted to silicones, the electrical properties of which have led to the introduction of a completely new class of insulation (Class H).

George H. Alexander Machinery, Ltd., 82–84, Coleshill Street, Birmingham, 4. **D.632.**—"AB" honing equipment includes a new range for the American market. The "Galex" adjustable plug gauge, a sheet metal testing machine and the Rockwell hardness tester are accompanied by special purpose gauges made to customers' requirements. Among P.G. optical instruments are a comparometer, an angle meter, a profiloscope, and a projectoscope and cam measuring machine.

Allspeeds, Ltd., Oakenshaw Works, Clayton-le-Moors, near Accrington. **D.257.** The "Kopp" infinitely variable speed gear available from ¼ to 6 h.p. provides constant b.h.p. through the full speed range with a 9 : 1 ratio.

Amplec, Ltd., Grange Lane, Accrington. **C.303.**—Washboilers are available in round and square designs, in galvanized and vitreous finishes. Power agitated washing machines are also on view.

Association of British Chemical Manufacturers, 86, Strand, London, W.C.2. **C.617/516.**—In this Association's composite exhibit, which has this year been transferred from Olympia, twenty member companies have separate display units.

Austinlite, Ltd., Lighthouse Works, Smethwick, 40. **B.309/208.**—See Chance Brothers, Ltd.

Auto Diesels, Ltd., Cowley Mill Road, Uxbridge. **Outdoor 1229.**—Among standard lighting and generating equipment from 120 W to 93·75 kVA are generator sets for contractors' use (illustrated) and a dual voltage, dual frequency machine to operate at both 400 V, three-phase, 50 c/s, and 230 V, three-phase, 60 c/s, as well as dual automatic equipments designed for unattended operation for radio telecommunication manufacturers. With standard "Floodmaster" pumping units from ⅜in to 8in are the new models in the "Floodmaster B" range.

W. & T. Avery, Ltd., Soho Foundry, Birmingham, 40. **D.523/420.**—A new machine for precision tensile testing up to 2,500 lb can be used on a large number of materials ranging from metallic wire or strip to plastics, textiles, and cement. A recording device can be fitted. An electro-dynamic balancing machine (illustrated) indicates either the amount of correction necessary at two preselected positions in each of two planes, or the actual amount and position of unbalance in each plane. High sensitivity is obtained without electronic amplification. There are no delicate or easily damaged mechanical parts.

B.I.F. Engineering Co. (1940), Ltd., 212, Aston Road, Birmingham, 6. **A.622.**—See Midland Fan Co., Ltd.

B.K.B. Electric Motors, Ltd., 132, Icknield Street, Birmingham, 18. **C.607.**—Emphasis is placed on the availability of power supply from the company's alternators and generators in cases where there is no mains supply. The application of the small motors in the "Luton" range in the industrial, instrument manufacture and commercial fields is also a prominent feature. The "Birmingham" range of products covers a.c. motors up to 7½ h.p., d.c. motors up to 25 h.p., d.c. generators up to 20 kW, and self-exciting self-regulating alternators up to 22 kVA, flange mounting a.c. and d.c. machines, motor generators and motor alternator sets. Special machines are manufactured to suit all requirements.

Bakelite, Ltd., 12, Hobart Place, London, S.W.1. **C.404.**—Bakelite moulding materials have long provided many components for the electrical industry (illus. p. 773) and Bakelite laminated sheet, tube and rod is widely used in the electrical industries for punchings, terminal plates, conduits, etc. New compounds include phenolics and polystyrene modified with rubber to give greatly improved impact strength, glass-filled materials for a combination of strength, low water absorption and heat resistance, and alkyds with excellent electrical properties for use in standard moulding plant. Bakelite resins are employed for a wide range of bonding operations, including lamp and valve capping. Components are seen "potted" in Bakelite polyester resins for protection from shock, heat or moisture. The "Vybak" range of p.v.c. compounds includes extrusion and moulding compounds, rigid and elastomeric sheet.

H. J. Baldwin & Co., Ltd., 132, Arkwright Street, Nottingham. **C.53.**—Cable protection covers, conduits, electrical distribution equipment, link boxes, pole boxes, cable jointing equipment, "Thermat" electric blankets, domestic and industrial heating elements and mica formers.

Bastian & Allen, Ltd., Ferndale Terrace, Harrow. **C.711.**—Two new totally enclosed electrode steam boilers, the "Stanmore" (illustrated) and the "Kenton" are shown working. They have loadings of 30 and 70 kW respectively, giving outputs of 100 and 230 lb/hr of steam. A standard electrode steam boiler is seen complete with patented modulator and control panel. To complete the display there are an electrode water boiler suitable for space heating and thermal storage plant, an electric air heater for grain drying or plenum heating, and a 20 kW steam jet cleaner for use in the motor, aircraft, food, fish and other industries.

Bates Brothers (Sheet Metal Workers), Ltd., Reliance Works, Shady Lane, Baguley, Manchester. **Outdoor 1346.**—Transformer tanks and heavy steel welding.

Bayliss, Jones & Bayliss, Ltd., Victoria Works, Wolverhampton. **Outdoor 1325/1224.**—Telegraph ironwork, transmission line equipment, railway fastenings, etc.

Belmos Co., Ltd., Bellshill, Lanarkshire. **C.415/314.**—Air-break switchgear and automatic motor control gear are available both for industrial and flameproof applications up to 650 V. The industrial exhibits include metalclad switchboards and group motor control boards in single, double and triple tier formation, and contactors from 30 to 450 A rating with a variety of instrumentation and control arrangements. Among control pillars for single- or multi-motor control are direct-on rotor resistance and auto-transformer starters, a new design of housing for multi-motor control being introduced. Special cubicles for automatic power factor correction (illustrated) have been developed. The flameproof exhibit includes a two-unit switchboard showing coupled together a 200 A circuit breaker distribution unit A.S.T.A. tested to 7·5 MVA and a direct-on starting unit of 75 A capacity. Of special interest to the oil industry is a 30 A contactor unit with isolator which can be used as a single unit or mounted in double tier formation, readily extensible into multi-unit control. A new 100 W flameproof lighting fitting is also shown, as well as a new star-delta starter for motors up to 15 h.p. at 440 V.

Bendix Home Appliances, Ltd., Albion Works, Kingsbury Road, Erdington, Birmingham, 24. **B.517/416.**—The Bendix home and commercial washing machines have thermostatic water temperature control, a "water rationer," tumble action cylinder and flat porcelain top. The clothes are washed, rinsed three times and damp dried automatically.

Benton & Stone, Ltd., Aston Brook Street, Birmingham, 6. **D.425.**—Electrically operated pneumatic valves.

Berry's Electric, Ltd., 86, Newman Street, London, W.1. **C.507/406.**—Period reproduction fires are being introduced with modified heating element assemblies which not only bring the fires into line with B.S.S. but increase efficiency and improve appearance. The same heating system is incorporated in a new log basket grate which can be installed in an open fireplace. The "Raydair" background heater is also on view. The 1½ gal and 2½ gal "New Look" flat backed, flush fitting water heaters are available in four attractive finishes, while competitive new immersion heaters are made in seven different lengths. Many new decorative lighting fittings have been developed, especially in contemporary designs, and there is a wide selection of period reproduction chandeliers. Pendants, wall brackets, flush and semi-flush ceiling fittings, floor and table standards are shown in a variety of finishes and materials. On the industrial side "Viking" switchgear and accessories are displayed.

F. H. Biddle, Ltd., 52, Clerkenwell Close, London, E.C.1. **B.330.**—In addition to standard heating, ventilating, cooling, dehumidifying and general air-conditioning equipment, there is a new "Vectair" floor type room cooler (illustrated) incorporating propeller fans. Other new products are a veranda type air-conditioning unit for tropical use, a 7½ ton capacity air-conditioner, an adjustable ventilation grille, and improved unit heaters.

Birmingham Battery & Metal Co., Ltd., Selly Oak, Birmingham, 29. **D.514.**—Brass, copper, phosphor-bronze tubes, sheets, rods, etc.

Blending Machine Co., Ltd., 3, Bond Street, Birmingham, 19. **C.605.**—Magnetic separators for extracting fine iron from liquids, etc.

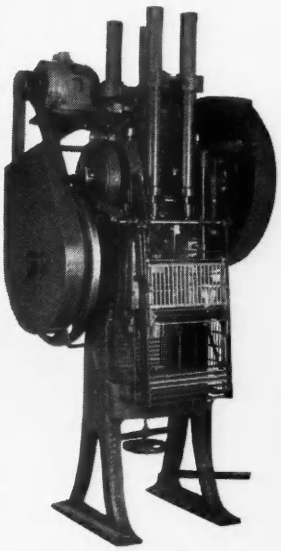
Bolton Gate Co., Ltd., Waterloo Street, Bolton. **D.302.**—The "Bolton" patent shutter doors are shown both with push-button control and also with automatic operation by means of photo-electric cells and time switches.

Thomas Bolton & Sons, Ltd., Mersey Copper Works, Widnes. **D.518.**—Apart from wire and strip, this exhibit comprises copper, tubular and laminated busbars; cellular conductors, commutator segments; end rings for rotor and stator coils; aluminium-nickel-iron bronze resistance rings; pantograph collector strips; choke and cut-out coils; switch blades; and extruded and drawn sections.

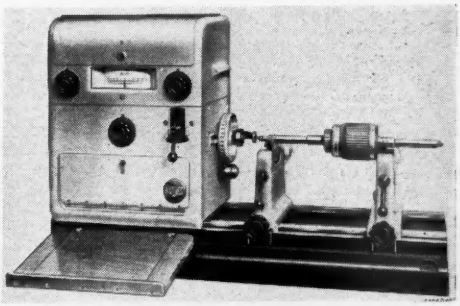
F. H. Bourner & Co. (Engineers), Ltd., Manor Royal, Crawley. **D.744.**—Cartridge operated power driving tool for fixing into brick, steel, concrete without drilling or plugging.

F. W. Brackett & Co., Ltd., Hythe Bridge Ironworks, Colchester. **D.345.**—With small water pumps are water screens as used for the continuous screening of water for power stations, factories, etc.

Geo. Bray & Co., Ltd., Leicester Place, Blackman Lane, Leeds, 2. **C.519/488.**—Metalclad embedded heating elements in strip, ring and sheathed wire form are made for almost every medium and low temperature electric heating purpose. Ceramic insulators and refractories (illustrated) include small ceramics made to close tolerances in different materials to meet the wide range of electrical and electronic applications; parts for cathode-ray tubes, radio valves, resistors and capacitors; and parts for cookers, immersion heaters and pyrometric apparatus

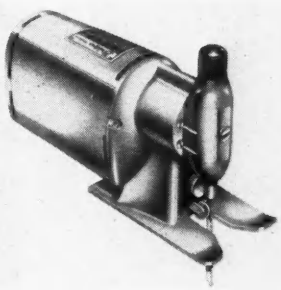


Taylor & Challen double-action drawing press

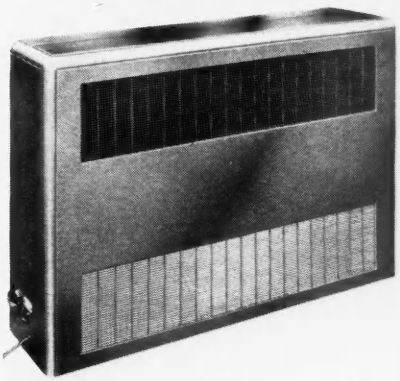


Avery electro-dynamic balancing machine

Typical Geo. Bray ceramic components

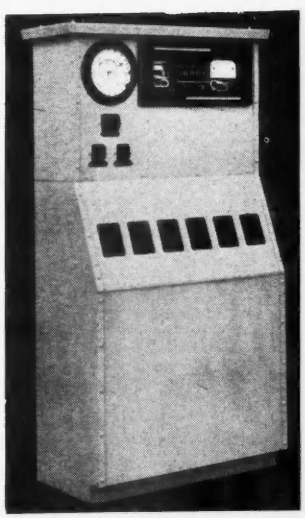


Bridges "Tool Power" portable jig saw

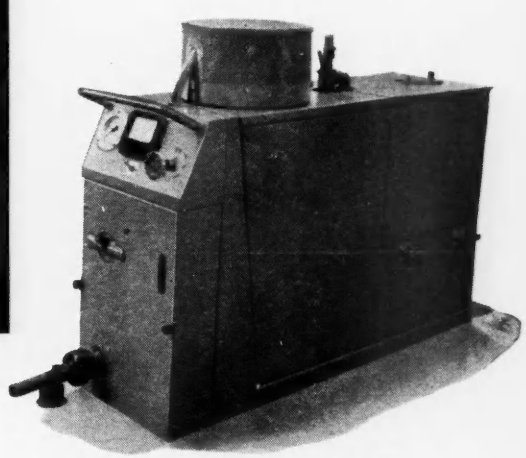


Above: Biddle "Vectair" propeller fan floor type room cooler

Below: Bastian & Allen "Stanmore" electrode steam boiler



Belmos power factor control cubicle



where the insulator has to withstand thermal shock.

S. N. Bridges & Co., Ltd., Bridges Place, Parsons Green Lane, London, S.W.6. **C.504.**—Among the "Tool Power" range of power tools are a ¼in general purpose drill, 6in disc sanders and polishers, an orbital sander and a portable jig saw (illus. p. 767). For heavier duty the "More Power" tools include ¼in, ⅜in and ½in drills, 7in disc polishers and sanders, 2½in and 4in belt sanders, and a ¾ h.p. orbital sander. Bench grinders (6in and 8in), routers, bench spindle moulders, edge planers, bl. wers, shears, valve refacer kits, portable surface grinders and flexible shaft tools are further products.

British Bellows, Edgemond Avenue, Tyburn, Birmingham, 24. **D.425.**—See Benton & Stone, Ltd.

British Bronson, Ltd., Stocklake, Bucks. **D.430.**—Electric motors.

British Electrical Development Association, 2, Savoy Hill, London, W.C.2. **C.509/408.**—Applications of electricity to industrial finishing are demonstrated in conjunction with the Midlands Electricity Board. The importance of the integration of finishing processes is emphasized by a display representing a product receiving initial cleaning, drying, spraying, stoving and counting, each process being applied on a conveyor system. Supporting this display are a Canning lead-sheathed immersion heater for cleaning, a G.E.C. industrial blower for drying off, a Peabody spray unit for electrostatic spraying, a Metropolitan-Vickers wall-mounting infra-red unit for stoving and a Radiovisor light cell unit for counting. As examples of electricity's aid to industrial efficiency there are a Canning barrel electro-plating unit and a Metropolitan-Vickers infra-red drying tunnel operating a Viskring bottle capping unit. Illustrating recent applications of electricity to industry are an Edwards high-vacuum coating machine and a "Spraytex" electrostatic flock depositing machine employed in display work. An American colour film deals with electrostatic spraying in industrial plants.

British Ermeto Corporation, Ltd., Beacon Works, Hargrave Road, Maidenhead. **D.723.**—Pipe couplings and valves.

British Insulated Callender's Cables, Ltd., Norfolk House, Norfolk Street, London, W.C.2. **C.216.**—See Cable Makers' Association.

British LaBour Pump Co., Ltd., Blundell Street, London, N.7. **D.339.**—Vertical and horizontal self-priming and flooded suction pumps for the chemical and allied industries are made in all metals and are specially designed for corrosion and abrasive resisting service.

British Manufactured Bearings Co., Ltd., High Street, Crawley. **D.137.**—Precision miniature ball bearings.

British Moulded P..stics, Ltd., Avenue Works, Walthamstow Avenue, London, E.4. **C.614.**—See National Plastic (Sales), Ltd.

British Non-Ferrous Metals Federation, 132, Hagley Road, Birmingham, 16. **D.219.**—This stand serves as an information bureau and displays literature issued by federated firms, together with a special booklet.

British Tyre & Rubber Co., Ltd., Herga House, Vincent Square, London, S.W.1. **D.615.**—Conveyor and transmission belting, V-belts, anti-vibration mountings, etc.

British Vacuum Cleaner & Engineering Co., Ltd., Ermyn Way, Leatherhead. **C.305/206.**—In addition to "Goblin" domestic cleaners, washing machines, "Teasmade" and "Tele-T" automatic tea-makers and the "Lumilarm" bedside lamp and alarm clock this exhibit comprises a full range of industrial portable (illustrated) and fixed vacuum cleaning equipment, and industrial exhausters. The cleaners can be equipped specially for such purposes as cleaning delicate contacts in automatic telephone exchanges, and for domestic chimney sweeping. The fixed plant equipment, supplied from 1½ to 40 h.p. or more, can be employed for conveying purposes as well as cleaning.

Broadwall Engineering Co., Ltd., Beco Works, Kent House Lane, Beckenham. **C.710.**—The re-designed C.S. and E.C.S. pumps have entirely new float switches.

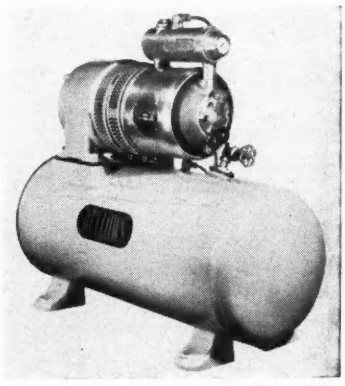
Bromhead & Denison, Ltd., 48, Gowers Walk, Commercial Road, London, E.1. **D.745.**—"The Lubex" electrically heated oil refiner.

Brook Motors, Ltd., Huddersfield. **C.304.**—The new 350 h.p. drip proof motor (illustrated) has loose louvres over the ventilation ports in each endshield, which can be rotated to afford drip proof protection in any mounting position. Cartridge bearing housings enable the motor to be dismantled without disturbing the bearings. The centrally mounted rotor can be reversed if connections are required from the other side. Smaller than the "Gryphon" model, the B.S. 42 type fractional h.p. motor meets the need for compactness in small industrial and domestic appliances. It is available protected or totally enclosed, for flange or face mounting, with or without feet. The drip proof motor range to B.S. Draft Specification CR (Ele) 4464 is supplemented by totally enclosed fan cooled types to the same draft specification. Another recent introduction is a 4in magnetic brake which can be fitted to small motors of Brook or other manufacture. Control gear completes the display.

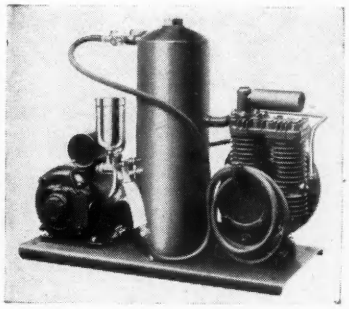
Alfred Bullows & Sons, Ltd., Walsall. **D.743/642 & Outdoor 1354.**—A composite exhibit by the British "Hydrovane" licensees includes Bullows industrial compressors of all sizes and for special purpose applications (illustrated), Burtonwood garage and portable compressors of over 60 c.f.m., and Hymatic portable compressors of less than 60 c.f.m. and certain special purpose units. Two new items are the Bullows-Binks model 19 spray gun and the Bullows-Berridge rotating spindle automatic spray painting machine.

Bulpitt & Sons, Ltd., St. George's Works, Icknield Street, Birmingham, 18. **C.506.**—"Swan Brand" kettles are available in a wide range of models, capacities, finishes and loadings. Coffee percolators, fires, toasters, urns, steam cookers, glue pots, heating pads and blankets are other electrical appliances on show and there is a full range of ground base aluminium hollow-ware.

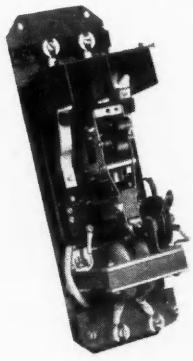
George Burn, Ltd., City Tube and Conduit Mills, Rabone Lane, Smethwick, Birmingham. **B.309/208.**—Electrical conduit, metal channels, angles, sections, etc.



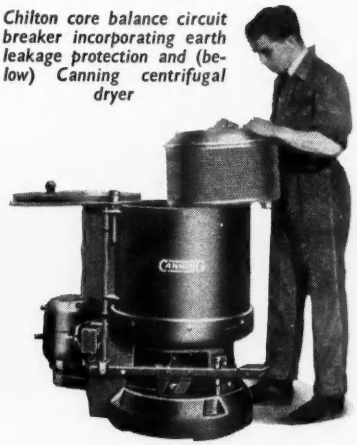
Bullows receiver mounted 9 cu ft/min "Hydrovane" compressor



Colour Sprays paint spraying unit



Chilton core balance circuit breaker incorporating earth leakage protection and (below) Canning centrifugal dryer



Burtonwood Engineering Co., Ltd., Warrington. **D.743/642 & Outdoor 1354.**—See Alfred Bullows & Sons, Ltd.

C.A.V., Ltd., Acton, London, W.3. **C.501.**—Electrical equipment for commercial and passenger vehicles, industrial, agricultural and marine engines includes generators and engine starters, the 6in dia "Axial" type starter and the new S.945 model designed for agricultural tractors and other vehicles with oil engines of medium size. Generators and control boards, switchboards and switch panels, batteries and direction indicators and lamps are also represented, special attention being drawn to double dipping headlamps and new large diameter rear lamps.

C.E.A. (Distribution), Ltd., 1/3, West Avenue, Clarendon Park, Leicester. **B.220.**—Refrigerators of various types.

C.S.A. Industries, Ltd., Avon Works, Wharf Street, Warwick. **B.605/504.**—"English Rose" equipment includes specially styled refrigerators, cookers, etc.

Cable Makers' Association, 52/54, High Holborn, London, W.C.1. **C.216.**—Cables used in industry, transport, building and communications are accompanied by coloured transparencies illustrating the particular themes. Plastic cables are also represented.

F. E. Callow (Engineers), Ltd., Kirkby Trading Estate, Liverpool. **D.629.**—A working model of a mill installation is complete with a "Liverpool Callow" 1CD pulverizer, "ter Linden" cyclone, multicyclone dust collecting equipment, rotary air seals, and return air circuit. The 3CD pulverizer, which is the largest made by the company, is also on show with other items of milling equipment.

Campbell Engineering Co., Ltd., Sherman Works, Sherman Road, Bromley, Kent. **A.328.**—Immersion heaters available in both automatic and non-automatic types accompany "Hotway" rapid water heaters.

W. Canning & Co., Ltd., Great Hampton Street, Birmingham, 18.—**D.207/108 and D.209/110.**—The latest hydraulic-electric automatic plating plant seen in operation is of the single process type complete with ancillary equipment. A comprehensive range of plating and polishing equipment includes the new "Forward" open-mouthed plating barrel with a hydraulic raising and lowering system, for most metals other than chromium; the "Victor" barrel for bulk chrome plating of small parts; "Typhon" barrels in three sizes; the "Tynee" filter unit for most solutions other than chrome; the "Gallay Junior" rotary finishing barrel; centrifugal dryers (illustrated); "Lacomatic" centrifugal lacquering machines; a centreless polishing machine; a new 3 h.p. polishing motor; an attachment for polishing irregular shapes; plating generators; resistances; meters; brushes; wheels, etc.

Tom Carrington & Co., Ltd., Lyndon Tool Works, Stony Lane, West Bromwich, Staffs. **D.610.**—Portable power pipe threading tools, machine tools, etc., for electricians.

Carter & Co. (Nelson), Ltd., William Street, Nelson. **C.203.**—Among unit heaters from 1½ kW to 15 kW with control gear are flush mounting 1½ kW or 3 kW units. Sirens from ¼ h.p. to 20 h.p. (illustrated) include the 4/5 h.p. Home Office type and a new whizzer siren supplied for voltages from 6 V to 250 V.

For mounting on vehicles it can be fitted with a flashing light. Also exhibited are fire alarm pushes for industrial fire alarm installations, for which the company manufactures central controllers.

Chance Brothers, Ltd., Glass & Lighthouse Works, Smethwick, 40. **B.309/208.**—Marine and aviation lighting equipment, generating plant and switchgear, submersible pumps, etc.

Chilton Electric Products, Ltd., Hungerford, Berks. **C.606.**—A current balance circuit breaker (illustrated), which works on a new differential system, incorporates earth leakage protection. See also London section.

Christy & Norris, Ltd., Broomfield Road, Chelmsford. **D.403.**—Disintegrators, pulverizers and hammer mills are available for grinding a varied range of materials.

Clang, Ltd., Crown Yard, Cricklewood, London, N.W.2. **C.210.**—A full range of electrical accessories and conduit fittings for domestic and commercial installations is shown, including aircraft and weatherproof types, dimmer switches and ejector plugs.

Clegg & Coupe, Ltd., Molesworth Street, Rochdale. **B.222.**—The model HN (boiling type) "Prefect" washing machine (illustrated) incorporates many improved features including a new double trip bar release reversible roller wringer. The unheated model FN is similar, while model F incorporates some of the new features but has the original wringer.

Clyde Fuel Systems, Ltd., Queen Elizabeth Avenue, Hillington, Glasgow, S.W.2. **C.235.**—Automatic controls for oil and coal burning plant.

Coalport Metalware, Ltd., Coalport, Ironbridge, Shropshire. **A.325 & A.330.**—New double sided illuminated shaving mirrors in chromium plated brass frames are magnifying on one side.

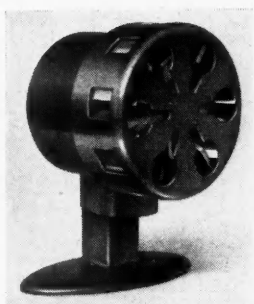
Cochran & Co., Annan, Ltd., 34, Victoria Street, S.W.1. **D.542.**—Models of the "Sinuflo" economic boiler, a vertical multitubular boiler and a Ruths steam accumulator are accompanied by photographs illustrating the full range of products.

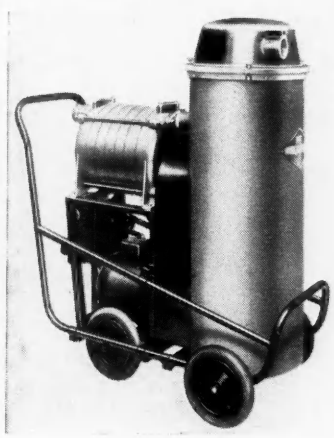
J. Collis & Sons, Ltd., Regent Square, Gray's Inn Road, London, W.C.1. **D.625/524.**—Examples of the company's mechanical handling equipment include the "SlatVeyor," the "Power-RolaVeyor," a wide range of "RolaVeyors," light and heavy types of "MotaVeyors," ball and table "TransVeyors," trucks and electric-hydraulic and electric-hydraulic-telescopic stackers.

Colour Sprays, Ltd., 64, Heath Street, Hampstead, London, N.W.3. **D.600.**—Of special interest is a small paint spraying outfit (illustrated) which is practically silent, needs the minimum attention and delivers 2½ cu ft/min at a maximum pressure of 60 lb/sq in.

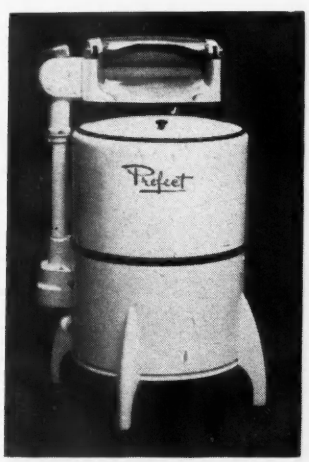
Columbus-Dixon, Ltd., Capitol Works, Empire Way, Wembley, Middlesex. **C.611.**—"Dixon" and "Columbus" industrial and commercial floor maintenance equipment includes machines for cleaning, polishing, scrubbing and drying all types of floor, as well as carpet shampooing and polish spraying.

Concentric Manufacturing Co., Ltd., Tyburn Road, Birmingham, 24. **D.222.**—Among this company's products are the "Streamline" automatic pie and tart moulding and filling machines; a bread slicing machine with wrapping and sealing

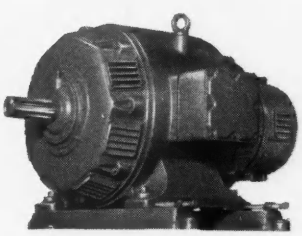




Carter "M" type siren and (below) B.V.C. portable industrial vacuum cleaner model T23



Clegg & Coupe "Prefect HN" washing machine



Brook 350 h.p. drip-proof motor

unit; a cutlery washing, sterilizing and drying machine; the " Lofstrand " glass washing, sterilizing and drying machine; and the " Tealarm " automatic tea-making apparatus.

Concordia Electric Wire & Cable Co., Ltd., Long Eaton, nr. Nottingham. **C.740.**—Wires, cables and flexibles insulated with enamel, cotton, silk, rayon, nylon, paper, glass, rubber, plastic materials, lacquer, varnished cambric, etc.; bare and insulated resistance wires; cord assemblies; insulating varnishes, etc.

Connollys (Blackley), Ltd., Blackley, Manchester, 9. **C.216.**—See Cable Makers' Association.

Constructors, Ltd., Tyburn Road, Erdington, Birmingham, 24. **D.401/300.**—The use of " Adjusteel " shelving effects a large saving in floor space.

Conveyancer Fork Trucks, Ltd., Liverpool Road, Warrington. **D.717/616.**—The " E2-20/3W " 2,000 lb electric three-wheel fork lift truck (illustrated) is a development of earlier models. It has a 9ft lift mast and large capacity easily accessible batteries.

Co-operative Wholesale Society, Ltd., National Works, Hall Street, Dudley. **A.619/514.**—Vacuum cleaners, washing machines and fluorescent lighting equipment are among this company's electrical products.

Copper Development Association, Kendals Hall, Radlett. **D.232.**—The covering of the entire surface of the main stand with square tiles of copper, brass, nickel silver and gilding metal is a reminder that copper and copper alloys are now fully available for unrestricted use.

R. H. Corbett & Co., Ltd., Hydrum Works, Burgess Hill, Sussex. **Outdoor 1350.**—" Hydruped " fork lift trucks and " Hydrum " loaders, stackers, etc.

David Crabtree & Sons, Ltd., Hope Ironworks, Dick Lane, Laisterdyke, Bradford. **D.148.**—A clutchless electric drive is a feature of this company's carpet loom.

Cradley Foundry & Engineering Co., New Road, Cradley, Staffs. **B.406.**—The continuous burning solid fuel " Kozi-Toes " fire is available with an electric conversion unit for summer use.

Craigpark Electric Cable Co., Ltd., Fleming Street, Springburn, Glasgow. **C.216.**—See Cable Makers' Association.

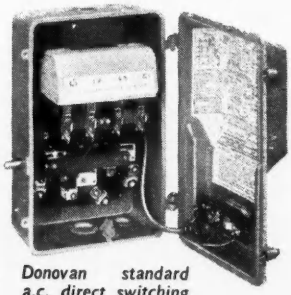
Crompton Parkinson, Ltd., Crompton House, 95, Aldwych, London, W.C.2. **C.216.**—See Cable Makers' Association.

R. Cruickshank, Ltd., Camden Street, Birmingham, 1. **D.226.**—Many standard equipments have been re-designed, including the two " Senior " plating barrels, the 1B and 2B centrifuges and the " Junior " plater. The new " Pureflow " all-steel filter unit is shown with a standard type filter press. The multi-oblique plating barrel with four baskets is useful for small batch plating jobs. Other items are a new type rumbling barrel, polishing mops, compositions, brushes, etc.

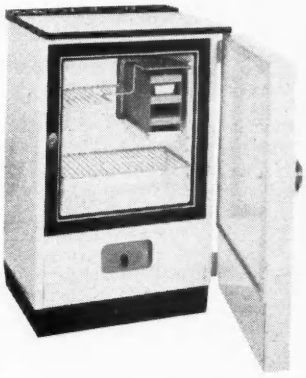
Dawson, McDonald & Dawson, Ltd., Compton Works, Ashbourne, Derbyshire. **C.718.**—The " DPF " spraying machine, diaphragm air compressors and vacuum pumps, the " S " air compressor, " Airless " and " A2 " water spray guns are products shown.

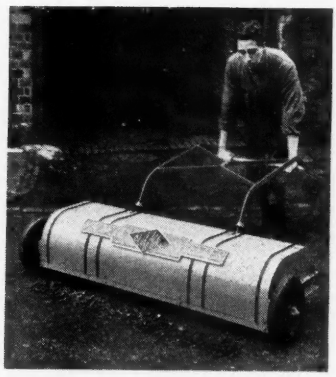
De-Birding, Ltd., Electric Avenue, Witton, Birmingham, 6. **D.713.**—A development of the electric fencer scares away birds without harming them.

Conveyancer E2-20 battery electric fork truck



Donovan standard a.c. direct switching starter for motors up to 7½ h.p.





Easiclene 2 cu ft refrigerator and (right) Electromagnets permnent magnet floor sweeper

Noel de Mille & Co., Ltd., 10, Sunnyside Avenue, Uddingston, Glasgow. **A.207.**—A new commercial peeler deals with 7 lb of potatoes in about a minute. It is compact and light and easily stored when not in use. It is finished in white enamel.

Desoutter Brothers, Ltd., The Hyde, Hendon, London, N.W.9. **C.412.**—Extra powerful rotor drills of $\frac{3}{8}$in and $\frac{1}{2}$in capacity, a close corner drill, and a corner nutrunner are additions to the range of pneumatic tools. Other electric and pneumatic tools are straight, corner and jig drills; countersinking tools; two-speed portable heavy duty electric drills of $\frac{3}{8}$in and $\frac{1}{2}$in capacity; screwdrivers and nutrunners; miniature screwdrivers; shears; nibblers; grinders; and multiple torque units.

Diesel Equipment, Ltd., Cowley Mill Road, Uxbridge. **C.728.**—Among a selection of standard generating equipment from 500 W to 40 kW are two new items, coupled petrol engined equipments, both a.c. and d.c. (illustrated) and a 1 kW equipment fitted with an air cooled diesel engine specially designed for builders' and contractors' use.

Dimplex, Ltd., Totton, Southampton. **C.715.**—Gastight radiators for use in hospitals, etc., are fitted with manual reset excess temperature cut-outs. They are available in both panel and column types. Flameproof models (illustrated) have been specifically designed for spray booths, paint stores, garages, etc. The domestic range of thermostatically controlled oil filled radiators now consists of eight panel units ($\frac{1}{2}$ to 2 kW) and two column models ($1\frac{1}{2}$ and 2 kW). Chromium plated towel rail attachments are available.

Donovan Electrical Co., Ltd., 70–82, Granville Street, Birmingham, 1. **C.417.**—This exhibit includes a.c. direct-switching starters up to 75 h.p. (illustrated), automatic star-delta starters, slip-ring motor starters and reversing starters; also special purpose control panels, limit switches, foot switches, pushbuttons, float switches, relays, etc. In addition there is a display of " Donlok," " Safuse " and " Scrutact " heavy duty ironclad switch and fusegear, together with a length of " Runtact " enclosed overhead busbar ducting of the latest protected type, with movable contact trolley for feeding hoist blocks, cranes or portable tools. " Reylovolt " l.v. transformers (manufactured to Reyrolle's specification) are shown for the first time.

Doulton & Co., Ltd., Albert Embankment, London, S.E.1. **C511/410.**—Electrical porcelain insulators have been used in the construction of the stand to demonstrate the general mechanical functions they perform in service. Heavy duty post insulators, as used for 132 kV and lower voltage outdoor substations, form the supports for the roof of the stand, with a raised reception area platform hung on suspension insulators, as used on 132 kV and 275 kV overhead lines. Typical rural distribution poles show pin type and shackle insulators used for distribution networks. Transformers incorporate a Doulton stoneware tank, and a steel tank incorporating Doulton insulators. Of particular interest is the one-piece blast tube used for the construction of a 275 kV circuit breaker. Lower voltage insulators include bushings with flanges capable of oil-tight joints with underground surfaces. Porous ceramics for filtration, dust recovery, diffusion, electrolysis and other processes are also shown.

Dunlop Special Products, Ltd., Fort Dunlop, Erdington, Birmingham, 24. **D.623/522.**—A range of engineering rubber

products includes flexible couplings, anti-vibration mountings and articles designed to suit customers' specific requirements.

Easiclene Porcelain-Enamel (1938), Ltd., Darlaston. **B.522.**—A 2 cu ft refrigerator (illustrated) is obtainable in white with black trimmings or cream and pale green. A washing machine with a power driven agitator has a built-in iron hand wringer which folds away when not in use. The "Easipump" for use with this machine is shown for the first time.

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2. **C.216.**—See Cable Makers' Association.

Electran Coil Winding & Transformer Co., Ltd., Lichfield Road, Birmingham, 6. **C.219.**—Power, radio and instrument transformers, a.c. and d.c. solenoids, d.c. power supply units, chokes, coils, resistances, battery chargers, low voltage units for lighting and portable tools (illus. p. 773), electric fencers, bobbins and pressings.

Electric Construction Co., Ltd., Bushbury Engineering Works, Wolverhampton. **C.708.**—A static fully-float charging rectifier is seen working on a demonstration G.P.O. exchange system. A totally-enclosed and pressure-ventilated electronically controlled Ward-Leonard drive (illustrated) is suitable for application to machines where extremely rapid speed control and speed response is required. A 15 kVA motor alternator set includes a self-excited, self-regulating alternator coupled to a totally-enclosed squirrel-cage motor built to the new British Standard dimensions 2083/1954. The alternator set is complete with automatic star delta starter for the motor, together with an electronic control cubicle. A British Standard dimension motor is shown in section to reveal details.

Electric Depot, Ltd., 114/115, Pritchett Street, Aston, Birmingham, 6. **C.725.**—Among industrial local lighting fittings is the "Lenslite" which combines illumination with magnification. Cable racks and tungsten contacts are other specialities.

Electrical and Electronic Development, Ltd., Bickford Road, Witton, Birmingham, 6. **D.713.**—The D2 portable tape recorder incorporates full monitoring facilities, twin speed, twin track, extended frequency response, low distortion and low noise level.

"Electrical Review," Dorset House, Stamford Street, London, S.E.1. **C.616.**—Representatives are available to give information on all matters relating to the electrical industry. Technical books on various aspects of electrical engineering are displayed.

Electro-Chemical Engineering Co., Ltd., 161, Queens Road, Weybridge. **C.609.**—The addition of "Zeromist" to chromium plating baths eliminates spray from chrome baths so that fume extraction is unnecessary and there is no loss of chromic acid. The material also reduces the surface tension of the solution so cutting dragout losses. Efco-Udylite "Perspex" plating barrels (illustrated) and a continuous dryer for barrel plated parts are shown.

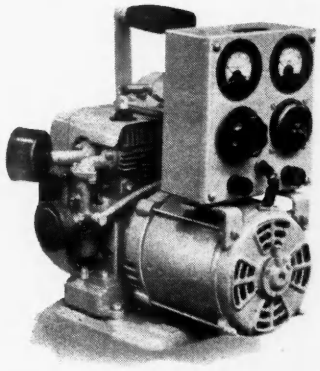
Electro Mechanical Manufacturing Co., Ltd., Marlborough Street, Scarborough. **C.419.**—The range of "Y" industrial unit construction switch fuse gear is well represented. The two indoor "Y" fuse switchboards illustrated below have 800 A oil circuit breakers as incomers and are arranged for future extension as a "back-to-back" switchboard.

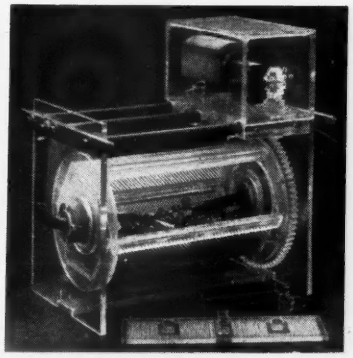
Electromagnets, Ltd., Boxmag Works, Bond Street, Birmingham, 19. **C.605.**—With a swarf separator, high intensity electro-magnetic conveyor heat unit and various types of permanent magnet separators are a new permanent magnet floor sweeper (illustrated), a high intensity permanent magnet overband separator and a patented permanent magnet conveyor head unit of only 6in dia, but possessing a separating power greater than a 14in dia magnetic drum. The new "Select-o-Load" lifting magnet control system greatly increases the degree of control available over the amount of material picked up or dropped by a lifting magnet. A 42in dia circular lifting magnet, complete with controller and generating set, is demonstrated.

Electronic Computors, Ltd., 1213, Stratford Road, Hall Green, Birmingham, 28. **D.224.**—Electronic instruments for industrial calculations are a speciality.

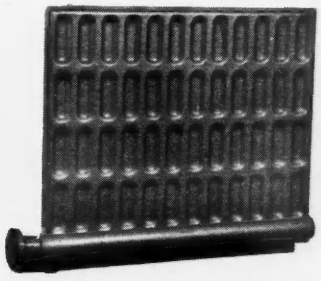
Enfield Cables, Ltd., Victoria House, Southampton Row, London, W.C.1. **C.216.**—See Cable Makers' Association.

English Electric Co., Ltd., Marconi House, Strand, London, W.C.2. **C.510.**—Fusegear comprises a flush type fuse switchboard, "Superform" distribution boards and isolators, an overhead busbar system, cartridge fuses, substation equipment, industrial fuseboards and combination fuse switchboards. An "F.600" 400 V 25 MVA switchboard incorporates a 1,600 A type "OB.3" air circuit breaker and a 600 A type "OB.2" air circuit

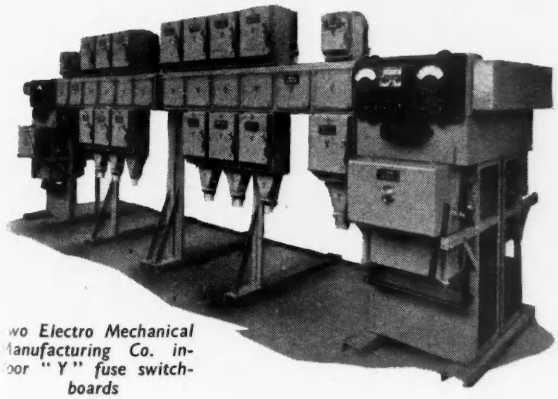




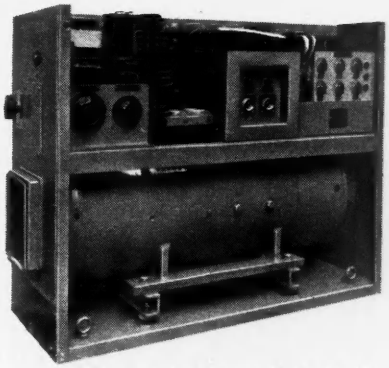
Diesel Equipment petrol driven 500 W a.c. generating set and Efco-Udylite "Perspex" plating barrel (Electro-Chemical Engineering Co.)



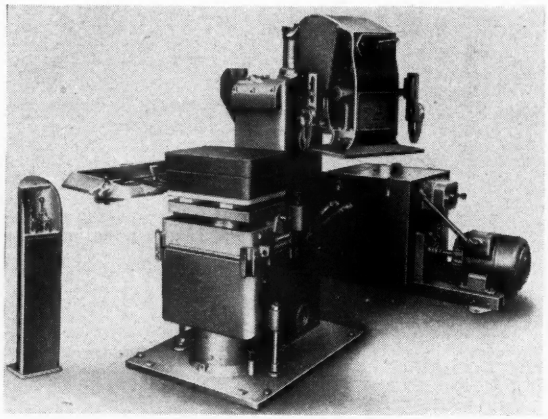
Dimplex flameproof oil filled radiator

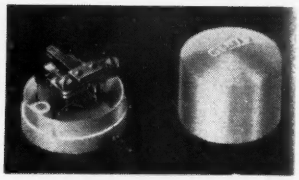


Two Electro Mechanical Manufacturing Co. indoor "Y" fuse switchboards



E.C.C. electronically controlled Ward-Leonard equipment





Above: Ether "Thermaltrol" electronically operated temperature controller. Left: Foundry Equipment HEBI moulding machine. Right: Gent miniature buzzer

breaker. Typical industrial motors include a flange mounted geared motor unit, a chemical works motor, a foot mounting unit, a crane motor and a flame-proof type. Fractional h.p. motors are also represented together with a hand-dryer and typical instruments.

English Electric Valve Co., Ltd., Waterhouse Lane, Chelmsford, Essex. **C.732.**—Electronic transmitting valves for broadcasting, communications, radar and television; rectifiers; valves for h.f. heating; magnetrons; klystrons; thyratrons; travelling wave tubes; "Image Orthicon" camera tubes; stabilizers; and cathode ray tubes.

Ether, Ltd., Tyburn Road, Erdington, Birmingham, 24. **C.700.**—Electronically operated instruments for temperature measurement and control include Ether-Wheelco temperature controllers, the type 221 "Capacitrol," the "Wide-Strip" potentiometer recorder, and the new "Thermal-trol" temperature controller (illustrated) with detachable electronic unit. Among deflectional type temperature indicators and recorders are surface contact measuring instruments. Solenoid and diaphragm operated control valves are suitable for use for oil, steam, gas, air and water up to 300 lb/sq in pressure. The type T.A.C. 3-way valve for pneumatic control work is suitable for pressures up to 100 lb/sq in. The exhibit also includes molten metal pyrometers, optical pyrometers, radiation tubes and thermocouples.

Fan Equipment Corporation, Ltd., 26, Great James Street, London, W.C.1. **D.622.**—Centrifugal fans for ventilating, air conditioning, forced and induced draught, conveying systems, etc.; special extract units, impellers, etc.

Felco Hoists, Ltd., 29, Cromwell Road, London, S.W.7. **D.247/146 and Outdoor 1235.**—Electric chain and wire rope hoists are among this company's lifting equipment.

J. H. Fenner & Co., Ltd., Marfleet, Hull. **D.406.**—The taper-lock flexible couplings (illustrated) possess all the advantages of similar couplings plus those gained by the use of taper-lock bushes. The Mark 2 "Hainsworth" variable speed bolt has better wear slip resistance, great strength and stretch resistance, improved heat resistance and greater flexibility. There is a complete range of V-belts.

Fescol, Ltd., North Road, London, N.7. **D.529.**—Emphasizing the wide range of electro-chemical deposition plants available are a large drying cylinder (4ft dia by 11ft 3in overall length) "Fescolised" in nickel to prevent corrosion, and two small rolls ($\frac{1}{2}$in dia by $4\frac{3}{4}$in long) "Fescolised" in chromium. Photographs indicate the wide range of applications of the Fescol process.

Finney Presses, Ltd., Berkley Street, Birmingham, 1. **D.241.**—A Greer-Mercier hydro-pneumatic accumulator is seen operating a 100/120 ton downstroking press suitable for general plastic or rubber moulding, a 2 h.p. direct motor driven "S" type pump unit delivering 0·4 gal of oil per minute at 500 lb/sq in. A new relaying pump unit has been specially designed for use with the power pack. The latest presses for the plastics, rubber and engineering industries are on view.

Firth Co., Ltd., Warrington. **D.611.**—Electrode wire and welding wire in coppered and bright drawn finishes are shown both in coil and straight lengths.

Firth Vickers Stainless Steels, Ltd., Staybrite Works, Sheffield, 9. **D.419 and 318.**—"Staybrite" stainless and creep-resisting steels in sheet, strip, bar, forgings, centrifugal centri-die static and precision castings.

H. Fisher (Oldham), Ltd., Oldham. **C.602.**—Two washing machines are shown, the "Autowasher" (7 lb dry clothes capacity) and the "Autohome Laundry" (9 lb), the latter being available with heating elements if required. Both models can be fitted with a rotary ironer. Drying cabinets and cupboards are other products.

Fisher & Ludlow, Ltd., Bordesley Works, Birmingham, 12. **Outdoor 1318.**—Conveyors from the company's Materials Handling Division include overhead chain, floor, belt, portable and gravity types.

Flexible Drives (Gilmans), Ltd., 195, High Street, Smethwick, 41, Staffs. **D.506.**—Flexible shaft drive machines are available for tube and surface scaling, sanding, grinding, polishing and drilling. A new "Flexmaster" machine is specially designed for use with high speed resin bonded grinding wheels and cut-off discs.

Fodens, Ltd., Elworth Works, Sandbach, Cheshire. **D.235/136.**—Self-contained six cylinder generating set.

Foundry Equipment, Ltd., Linslade Works, Leighton Buzzard. **D.301/200.**—A semi-automatic shell moulding machine, a boxless high speed moulding machine (illustrated) and an automatic vertical core blower operating in conjunction with an automatic double rollover core stripping machine are representative of specialized foundry plant.

Fractional H.P. Motors, Ltd., West Heath Works, Rookery Way, Hendon, N.W.9. **C.721.**—A comprehensive range of small electric motors includes series, shunt, single-, two- or three-phase, shaded pole, capacitor and synchronous types. Two new geared units are introduced (illustrated). The "Sylentflo" hairdryer is notable for its quiet running and non-interference with radio and television.

W. T. French & Son, Ltd., Mysto Works, Browning Street, Ladywood, Birmingham, 16. **A.605.**—Domestic electrical appliances include irons, kettles, fires, coffee percolators and soldering irons. Bakelite electrical accessories are also represented.

G.W.B. Furnaces, Ltd., Dibdale Works, Dudley. **C.321.**—Interest is concentrated mainly on "Autolec" electrode type steam raisers and water heaters.

Gascoignes (Reading), Ltd., Gascoigne House, Berkeley Avenue, Reading, Berks. **D.715/614.**—In addition to fixed and mobile milking machines and milk coolers, this company is showing its "Humalactor" medical milking equipment.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2. **C.503/402.**—The company's contribution to marine engineering and equipment of all types for ships forms the principal theme of this exhibit. Auxiliary electrical power for ships is represented by a 550 kW turbo-generator set (illustrated) and by examples of marine motors for d.c. and a.c. supplies. Main and group switchboards as installed in ships using a.c. for their auxiliaries show typical layouts of fully enclosed and protected switchgear in cubicle type boards. D.c. and a.c. drip-proof motors are shown, while Woods "Aerofoil" fans include the new "Maxcess" pattern which comprises a retractable axial fan carried on hinges in a main casing flanged at each end for fixing. Two galley ranges are on view, together with luminous call and fire alarm systems, and Pirelli-General aluminium and other cables. The lounge section of the stand is furnished to afford a natural ship's setting for marine accessories such as fans, telephones, lighting fittings, and indirect cornice lighting with "Osram" fluorescent tubes.

Gent & Co., Ltd., Faraday Works, Leicester. **C.407.**—An extended range of clocks includes a new 6in dia size in both mains operated synchronous and master

clock controlled types, in many colours. Connected with the company's master clock system are a waiting train movement and the latest electronic chiming and striking equipment, together with an automatic electric one-hand operated time recorder and a programme instrument. As a contrast in size there is a new miniature buzzer (illustrated) 1⅛in high by 1½in dia. The latest metal-clad underdome bell is demonstrated and among other products are staff location and luminous call systems, visual indicators, water-level control apparatus, burglar alarms, watchman's tell-tale clocks, marine clocks, telephones and mine signalling apparatus.

Gittings & Hills, Ltd., Tower Varnish Works, Salford Street, Nechells, Birmingham. **B.328.**—This company specializes in industrial finishes.

W. T. Glover & Co., Ltd., Trafford Park, Manchester. **C.216.**—See Cable Makers' Association.

Gordon Tools, Ltd., Assam Works, Rockingham Street, Sheffield, 1. **D.227.**—Electricians' hand tools.

Gough & Co. (Hanley), Ltd., New Excelsior Works, Clough Street, Hanley, Stoke-on-Trent. **C.329/228.**—" Gough Graiseley " tower wagons are among mechanical handling equipment shown.

Greengate & Irwell Rubber Co., Ltd., Greengate Works, Salford, Manchester. **C.216.**—See Cable Makers' Association.

Grimston Electric Tools, Ltd., Progress Way, Purley Way, Croydon, Surrey. **D.612.**—Flexible shaft tools.

Guest Keen & Nettlefolds (Midlands), Ltd., Box No. 24, Heath Street, Birmingham, 18. **B.629/526, B.309/208, and Outdoor 1325/1224.** Self-tapping screws, bolts and nuts, washers, etc.

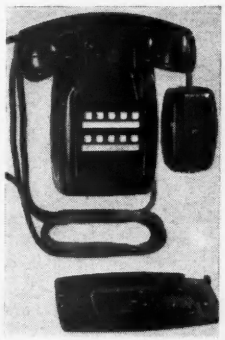
Guests Brass Stamping Co., Selly Oak, Birmingham, 29. **D.732.** Hot pressings in brass copper and non-ferrous alloys.

Gulf Oil (Great Britain), Ltd., Minoco Wharf, West Silvertown, London, E.16. **D.534.**—Petroleum media include " Silvertown " transformer, switch and other insulating oils; inhibited turbine oils; oils for time-lag control units; meter lubricants; electrical contact specialities; cable impregnants; and sealing compounds. A display of degraded oils shows problems posed. The " Acitest " unit is designed to give quick indication of transformer oil condition.

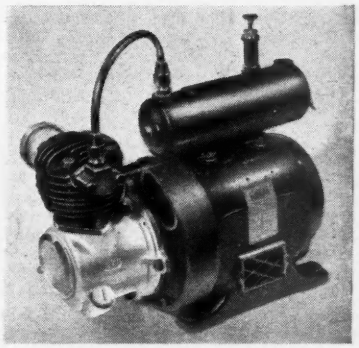
H.E.C. Compressors & Engines, Ltd., Levis Works, Stechford, Birmingham, 9. **D.739/638.**—Stationary and portable compressors (illus.) are on view with displacements from 2 to 21 cu ft/min and maximum pressures of 150 lb/sq in. The Mark I dual-purpose unit is seen fitted with the " Masterspray " unit for tyre inflation, paint spraying, etc. The new model 40 single cylinder unit has a displacement of 21·5 cu ft/min for pressures up to 200 lb/sq in.

H.J.S. Industrial Instruments, Ltd., 66–67, Gooch Street, Birmingham, 5. **C.734.**—Pressure switches, mercury switch and metal contact relays, process timers and indicators.

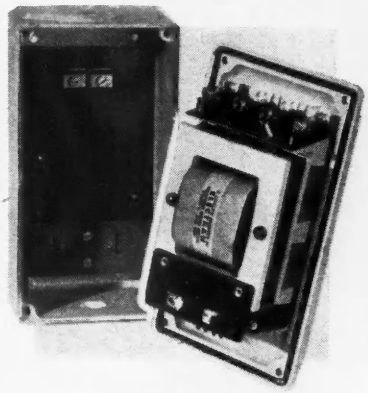
Hale & Hale (Tipton), Ltd., Dudley Port, Tipton. **D.609/508.**—Castings in high quality iron and in " Permalite " for the electrical industry include components for overhead power transmission, power stations, boilers, stokers, valve gear and



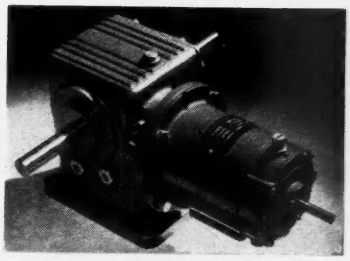
Telephone set moulded by Ericsson Telephones, Ltd., from Bakelite material



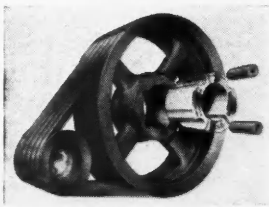
H.E.C. model DSB compressor direct coupled to ½ h.p. motor

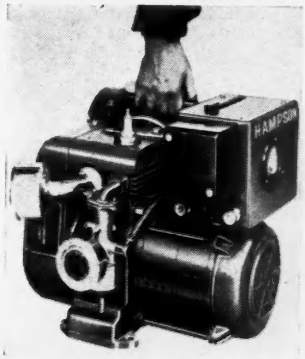


Electran low voltage lighting unit

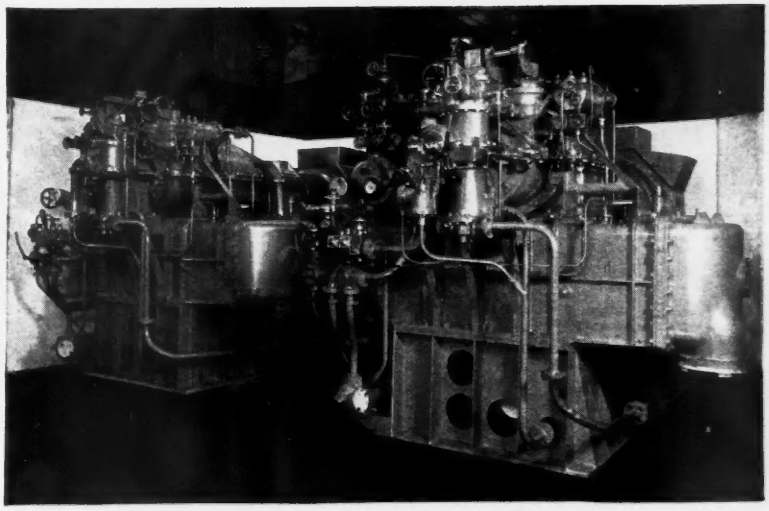


Fractional H.P. Motors geared unit





Fenner taper-lock V-belt drive and Hampson portable petrol engine driven battery charging plant



G.E.C. 550 kW marine auxiliary turbo-alternator sets

heavy flameproof switchgear. The capacity of the company's foundries has been greatly increased by the introduction of up-to-date mechanized moulding plant.

Hampson Industries, Ltd., Greets Green, West Bromwich. **C.702 and Outdoor 1312.**—Among engine driven battery charging plant is a new low priced portable petrol engine driven flange mounted battery charging plant (illus. p. 773) with a 500 to 1,500 W output. There are also new centrifugal water pumps and a new stationary automatic 16 cu ft/min air compressor. Diesel driven rotary arc welding equipment from 150 to 500 A capacity can be arranged for portable use, skid mounted or on trolley base.

Harris Engineering Co., Ltd., York Works, Browning Street, London, S.E.17. **D.444.**—With unit heaters is a new range of lightweight centrifugal fans for ventilation and other air moving purposes involving resistances up to 1in w.g.

G. A. Harvey & Co. (London), Ltd., Greenwich Metal Works, London, S.E.7. **B.329.**—Products include high pressure vessels, flanges, gilled tubes, and " Harco " perforated metals.

Harvey, Frost & Co., Ltd., Dunmow Road, Bishops Stortford, Herts. **D.405 and 304.**—Belt vulcanizers.

L. G. Hawkins & Co., Ltd., 30/35, Drury Lane, London, W.C.2. **C.403.**—Domestic electrical appliances comprise the " Ovenette," hairdryers, irons, toasters, bedside teamakers, food trolleys, milk boilers, handlamps, fires and washboilers.

W. T. Henley's Telegraph Works Co., Ltd., 51/53, Hatton Garden, London, E.C.1. **C.216.**—See Cable Makers' Association.

Alfred Herbert, Ltd., Coventry. **D.218, D.310 and D.321.**—" Sigma " multi-dimension inspection machines check as many as twenty-eight dimensions simultaneously at up to 4,000 per hour. Vertical mechanical comparators are made with five magnifications ranging from 500 to 5,000. A turret comparator is equipped with a 10-station rotation turret carrying fixtures for checking ten dimensions on a component. For high precision checking there is an electrical comparator calibrating to within a few millionths of an inch. Hilger enlargers and projectors, Watts horizontal microptic measuring machines, an alignment tester and an Avery direct-reading hardness tester are other interesting instruments. The " Atritor " dryer pulverizer has a wide application to the grinding and drying of materials in one operation. Small tools and accessories represent another aspect of the company's activities.

Higgs Motors, Ltd., Witton, Birmingham. **C.601.**—Attention is drawn to new totally-enclosed fan-cooled motors (illustrated) conforming to British Standard CN (Ele) 6814, and to the enlarged range of single- and three-phase self-regulating generators, designed for operation without the use of an automatic voltage regulator. In addition standard foot, flange and vertical mounting motors are representative of the company's range of rotating electrical machinery from $\frac{1}{8}$ to 1,000 h.p. Fractional h.p. units include split-phase, capacitor start and repulsion induction single-phase, together with polyphase and d.c. machines. Industrial motors and generators are displayed in a variety of types: flange mounting for individual drives, stator and rotor units for space saving, change speed motors, loom motors, geared motor units, polishing motors, etc.

Hilger & Watts, Ltd., 98, St. Pancras Way, Camden Road, London, N.W.1. **D.310.**—See Alfred Herbert, Ltd.

Hillman Electric Motors, Ltd., 2/3, Northwood Buildings, Northwold Road, London, N.16. **C.223.**—F.h.p. and geared motors from 1 r.p.hr. to 3,000 r.p.m. and with a torque of up to 60 lb/in include single and double reduction geared motors, induction and 3-phase units together with the new " Speedmor " industrial sewing machine motors of 1/6 h.p. and 1/5 h.p. The new F.H.5 permanent capacitor type geared motor, with an interchangeable gearbox which moves through 360 deg and speeds from 1 r.p.hr. to 600 r.p.m., is suitable for electronic calculators, etc.

Hilmor, Ltd., 65, Calshot Street, London, N.1. **D.147.**—Hand operated, hydraulic, and motorized tube bending machinery includes the " E.L." light weight portable conduit benders and the portable rotary hydraulic No. 3 conduit bender.

P. F. Hockley, Ltd., 31a, Farm Lane, Fulham, London, S.W.6. **C.705.**—See J. & H. Walter, Ltd.

Holden & Hunt, Ltd., Cox's Lane Works, Old Hill, Staffs. **C.719/620.**—Foot operated spot welders from 5 to 25 kVA capacities (illustrated) have various arm " set-ups " and one machine with a B.T.H. thyratron timer is demonstrated. A standard spot welder, one of a range of pedal and air operated machines to CSA requirements, is of interest to Canadian and American buyers. Automatic wire butt welding machines from 3 to 30 kVA capacities are demonstrated with alternative forms of clamping control. A 50 kVA air operated spot welder, with single, repeating spot welding sequences and a 30 kW, 1 sq in flash butt welding machine with air operated clamping tools can also be inspected.

Holt, Siron & Co., Ltd., Dominion Works, Alfred Road, Sparkbrook, Birmingham, 11. **B.405.**—" Mirrexo " illuminated shaving mirrors.

Henry Hope & Sons, Ltd., Smethwick, Birmingham. **B.415/320.**—Electrically-controlled windows.

E. C. Hopkins, Ltd., Grosvenor Street West, Birmingham, 16. **D.741.**—Flexible shaft machines, bench tool grinders, grinding and polishing machines, etc.

Hordern-Richmond (Sales), Ltd., Hydulignum Works, Haddenham, Bucks. **D.302.**—Electrical insulating components, silent gears, etc.

Horstman, Ltd., James Street West, Bath. **D.201/100.**—Electric hair clippers and small machine tools.

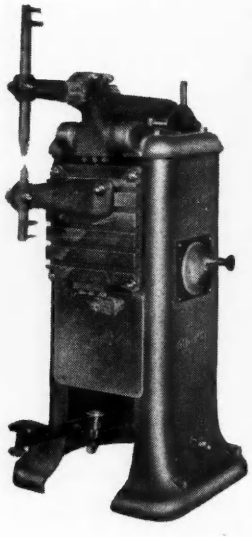
V. G. Howell & Co., Ltd., Crown Street, Wolverhampton. **C.405.**—Electrical control gear, regulators, resistances, contacts, rheostats, starters, switchgear, switch fuses and resistance boards and automatic relay controls.

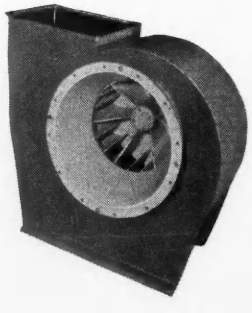
George H. Hughes, Ltd., Edgemond Avenue, Tyburn, Birmingham, 24. **D.42[illegible].**—See Benton & Stone, Ltd.

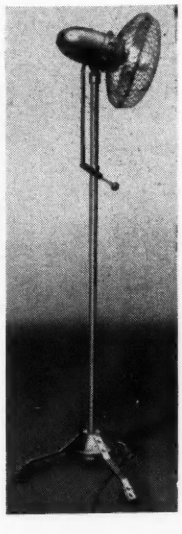
Hydrovane Compressor Co., Ltd., Long Street, Walsall, Staffs. **D.743/642 and Outdoor 1354.**—See Alfred Bullows & Sons, Ltd.

Hymatic Engineering Co., Ltd., Redditch. **D.743/642 and Outdoor 1354.**—See Alfred Bullows & Sons, Ltd.

Imperial Chemical Industries, Ltd., Imperial Chemical House, Millbank, London, S.W.1. **C.617/516, D.409/308, D.520 and D.619.**—On stand C.617/516 the company is co-operating in an exhibit arranged by the Association of British Chemical Manufacturers. Products of the Metals Division for the electrical industry seen on stand D.409/308 include condenser tubes and plates for power stations, copper wire and tape for the telegraph, telephone and cable industries, copper and aluminium extrusions for switchgear and " Kynal " solders and flux for soldering aluminium. In the Plastics Division's display (D.619) prominence is given to polytetrafluoroethylene, now available in quantity for the electrical and engineering industries, and for specialized applications, such as the covering of rollers in baking and allied industries to prevent sticking. Special attention is also given to nylon moulding powder for producing small precision engineering components, such as gear wheels, bearings and rings, in which its self-lubricating properties are of special value. Ranges of " Terylene " electrical insulation fabric, which has low weight, great strength and flexibility, and good







Above: Industrial Fan & Heater Company's " Resista " p.v.c. fan

Left: Holden & Hunt pedal operated spot welding machine

Right: Keith Blackman " Tornado " 16in air circulator

electrical properties, are displayed on stand D.520.

India Rubber, Gutta Percha & Telegraph Works Co., Ltd., Herga House, Vincent Square, London, S.W.1. **D.615.**—Conveyor and transmission belting, ebonite components, hose, primary batteries, etc.

Industrial Control Valves, Ltd., 66–67, Gooch Street, Birmingham, 5. **C.734.**—Motorized and magnetic valves, magnetic disc seat valves, etc.

Industrial Fan & Heater Co., Ltd., Evelyn Road, Birmingham, 11. **D.315/212.**—"Resista" p.v.c. fans (illustrated) successfully clear strong chemical fumes both acid and alkali without damage to the fan mechanism. Wet separators are particularly applicable for dust collection in the foundry industry.

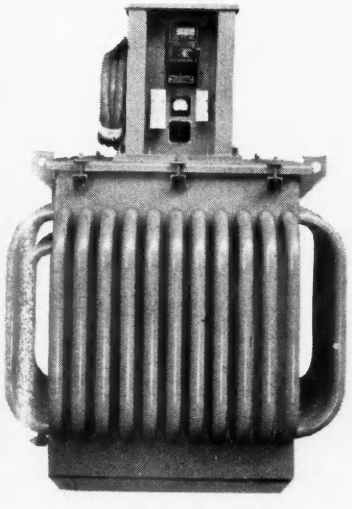
Industrial Guarding Equipment, Ltd., Mill Works, Alvechurch, Birmingham. **D.707.**—The "Pneumaster" press brake guard has been considerably improved. An efficient guard has also been produced for die casting machines and several types of guards are available for flypresses and power presses. Protective footwear with internal carbon steel toe caps is another speciality.

Industrial Pyrometer Co., Ltd., Gooch Street, Birmingham, 5. **C.734.**—Indicating, recording and controlling pyrometers include multi-point instruments, special pyrometers for molten metal and surface contact temperature measurements, thermo-couples and accessories. With the new indicating programme controller (illustrated) the desired programme or temperature control can be transferred to a cam which is rotated by a synchronous motor in 12, 24 or 48 hours as required.

Integra, Leeds & Northrup, Ltd., 183, Broad Street, Birmingham, 15. **C.411 310.**—Temperature indicators, recorders and controllers.

Invicta Electrodes, Ltd., Bilston Lane, Willenhall, Staffs. **D.717/616.**—Welding electrodes are accompanied by welding plants built to British Standard Specifications.

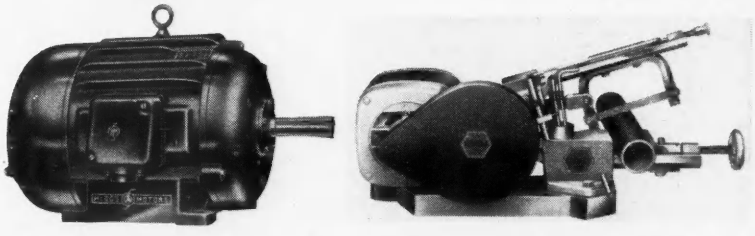
Ioco, Ltd., Netherton Works, Anniesland, Glasgow, W.3. **C.416.**—In addition to laminated plastics in paper and fabric base sheets, rods, tubes, bearings and gears, this company is showing varnished electrical insulating cloths and tapes consisting of cotton, silk, glass and "Terylene" base materials.



Legg oil-cooled vehicle charger

J.P. Engineering lawnmower

Industrial Pyrometer Co.'s indicating programme controller



Higgs three-phase fan-cooled induction motor and Kennedy small portable power saw

Ionic Plating Co., Ltd., Ionic Works, Grove Street, Birmingham, 18. **B.629/526.**—Plating work is illustrated by specimens and photographs.

Ipscol, Ltd., Shipyard Estate, Hythe, Southampton. **D.541/438.**—Automatic control and indicating equipment.

J.P. Engineering Co., Ltd., Meynell Road, Leicester. **A.425.**—Self-propelled electric lawnmowers (illustrated) are available in 12in, 14in and 16in sizes.

Jackson, Heywood & Co., Ltd., Bury New Road, Whitefield. **C.612.**—The "Twin-o-matic" twin 50 ton hydraulic plastic moulding press gives extra high speed production.

Jenolite, Ltd., 43, Piazza Chambers, Covent Garden, London, W.C.2. **B.221.**—Metal pre-treatment chemicals for rust and scale removal, rust proofing, paint stripping and black finishing.

C. H. Johnson (Machinery), Ltd., Adswood, Stockport. **Outdoor 1339/1238.**—The "Hylo Veyor" and "Loband-loader" combination demonstrates the variable elevation through a wide range, stockpiling up to heights of 30ft without second handling. Various other conveyors are also shown, together with self-priming pumps, concrete mixers and vibrators, compressors, etc.

Richard Johnson & Nephew, Ltd., Forge Lane, Manchester, 11. **B.417/322.**—A diverse range of ferrous and non-ferrous wires forms this exhibit.

Johnson & Phillips, Ltd., Charlton, London, S.E.7. **C.216.**—See Cable Makers' Association.

Keith Blackman, Ltd., Mill Mead Road, Tottenham, London, N.17. **D.521/418.**—Special attention is drawn to the new "Tornado" 33in dia trunnion-mounted marine type axial fan and the 16in type APA propeller-axial fan for general industrial purposes. Other items are the "Extravent" window fans, 16in portable air circulators (illustrated), centrifugal fans, dust collecting units and blowers.

W. Kennedy, Ltd., Station Works, West Drayton, Middlesex. **D.658.**—The Kennedy metal cutting hacksaw (illustrated) is claimed to be the smallest, lowest-priced portable power saw in the world. Driven by a 1/6 h.p. Hoover motor it is designed to cut a 0·01in slice. It cuts light-gauge tubes and sections as well as 2in by 2in solids.

Lamb, Hingley & Co., Ltd., Stour Works, Lye, Stourbridge, Worcs. **A.433.**—A clothes boiler comprises a 4 gal galvanized tub and a 2 kW element.

Langley London, Ltd., Kelvin Way, Crawley, Sussex. **C.226.**—Mica and "Micanite" in flexible commutator, heat resisting and moulding qualities; "Langboro Peerless" mica plate and a wide range of laminated plastics.

Lansing Bagnall, Ltd., Basingstoke. **C.727/628.**—The new SFS. 225 stand-on straddle fork truck, only 48in wide and 56in long, can stack 40in by 40in pallets at 90 deg in a gangway 5ft 4in wide. It can lift 2,500 lb to a height of 10ft 10in and a pivoting system ensures that on uneven floors all wheels remain in contact with the ground. A new circuit gives an almost stepless speed control with smooth starting. The maximum speed is 4½ m.p.h. Regenerative braking is provided and a battery charger with automatic charging cut-out, overload release and circuit breaker are built in. The new PP.230 pallet truck is claimed to be the smallest power pallet

truck in the world capable of handling a load of 3,000 lb.

Lawler, Ayers & Co., Ltd., Broad Street House, 54, Old Broad Street, London, E.C.2. **D.104.**—Of special interest to the electrical trades is the " Laco " model LH 100 hydraulic bending machine for bending ⅜in to 2in conduit to an angle of 90 deg, an attachment enabling a return bend of up to 180 deg to be made. A universal hole cutter is useful for fitting immersion heaters.

Legg (Industries), Ltd., Williamson Street, Wolverhampton. **C.325.**—This display consists of battery charging equipment employing metal rectification for all types of electric vehicles and trucks; oil and air cooled transformers up to 250 kVA; and rectifying equipment. For operation in humid or fume laden atmosphere an oil-cooled vehicle battery charger (illus. p. 775) has been evolved with both transformer and rectifier fully protected, leads being brought out from the tank to the control box.

Lewin Road Sweepers, Ltd., West Bromwich. **D.405/304.**—A pedestrian controlled battery drive universal sweeper-collector for factory or outdoor use is among this company's products.

Lifting Equipment, Ltd., Chittening Trading Estate, Avonmouth. **D.201/100.**—A 1 ton " Planet Major " hoist with a speed of lift of 36ft/min is operated by pendant pushbuttons through reversing contactors. Limit switches and an electro-magnetic brake are fitted. The company also makes hoists from 5 cwt to 3 ton capacity, overhead travelling cranes up to 10 ton, goods and passenger lifts, and flat belt and gravity roller conveyors.

Linolite, Ltd., 118, Baker Street, London, W.1. **D.201/100.**—Two new moulded strip light fittings for mirror, bedhead, hall, etc., lighting are introduced, types " SD " and " MH " (illustrated), the latter being fitted with clips for fitting on to frameless mirrors, etc.

R. A. Lister & Co., Ltd., Dursley. **D.205.**—This exhibit is confined to three power loaders. The new model PL6 is suitable for lifting cases, etc., from ground to lorry level or for stacking such goods to a height of 6ft. The other models are the 16ft (PL12) and 24ft (PL18). All three models are operated by 3-phase motors with reversing switches.

Liverpool Electric Cable Co., Ltd., 28, Queen Anne's Gate, London, S.W.1. **C.717.**—See London Electric Wire Co. & Smiths, Ltd.

Lloyd's Engineering Companies, Ltd., Lloyd House, 44, Bryanston Street, London, W.1. **C.602.**—Electrical equipment and appliances.

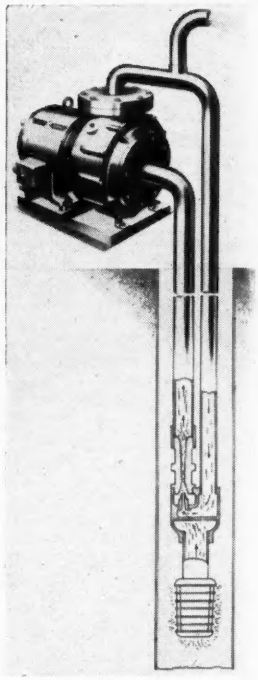
Thomas Locker & Co., Ltd., Warrington. **D.511/408.**—Electrical vibrating feeders and screens, sieving machines and conveyors, mechanical handling equipment, refrigerator shelves, etc.

Londex, Ltd., 207, Anerley Road, London, S.E.20. **C.722.**—This display covers relays, timers, level controls, flow indicators, pressure and vacuum switches, photo-electric controls, automatic power factor regulators and flashing beacons. In addition to an exhibit incorporating twenty different types of relays, two new relays are on view, a triple pole 60 A mercury switch contactor and an electronic relay (illustrated). Process timers demonstrated include synchronous motor driven units and very short interval types. For counting up to 500 impulses per second, a new form of electronic counter is available. Among controls for fluids and gas are pressure switches, a new unit sensitive to 2in to 8in w.g., the " Lectralevel " floatless liquid level control and a " Flowguard " remote flow indicator.

New Welbeck " Bak-Vak " industrial vacuum cleaner

Right: Morrison deep-well turbo-jet pump

Budd & Weston " Solo " solder gun with " Diakon " housing, shown by National Plastics (Sales), Ltd.



London Aluminium Co., Ltd., Westwood Road, Witton, Birmingham, 6. **A.411.**—" Diamond " aluminium utensils for electric cooking.

London Electric Wire Co. & Smiths, Ltd., 24, Queen Anne's Gate, London, S.W.1. **C.717.**—This company and its associates, Frederick Smith & Co., the Liverpool Electric Cable Co., Ltd., and Vactite Wire Co., Ltd., have arranged a comprehensive display of bare and insulated electrical conductors. These include " Lewcos " products—cotton, silk, paper, enamel, " Lewmex," " Lewmexglas," and " Lewbestos " insulated wires and strips; insulated resistance wires; " Glazite " connecting wires and copper braids and cords; " Anacos " bare copper and copper alloy wires, strips, strands, sections and forgings, telegraph and telephone wires, trolley and contact wires and overhead power transmission wires, aerial wire and earth rods; " L.E.C." rubber, thermoplastic, paper and cambric insulated cables; underground power cables, domestic cables and flexibles; " Vacrom " and " Eureka " resistance wires and tapes, molybdenum rods, wires and tapes and special wires for the lamps and radio valves.

Joseph Lucas, Ltd., Great King Street, Birmingham, 19. **C.501.**—Electrical equipment and accessories for cars, motorcycles, cycles and for marine and agricultural and stationary engines.

M.C.L. & Repetition, Ltd., Pool Lane, Langley, Birmingham. **D.414.**—This company specializes in repetition work turned from the bar in all metals on automatic and capstan machines.

William McGeoch & Co., Ltd., 46, Coventry Road, Birmingham, 10. **C.515.**—Among front and back-of-board switches are high amperage slow break units, fuse units, fuseboards, switch assemblies and mounting boxes for metering and recording instruments. Watertight switches, sockets and plugs and couplings include multi-pin patterns. A new indicator light fitting enables the lamp to be removed from the front of the panel. Both watertight and weatherproof lighting fittings are shown, as well as other industrial, commercial, marine and decorative types. Brass lampholders are also represented.

McKechnie Bros., Ltd., Rotton Park Street, Strand, Birmingham, 16. **D.500.**—Accompanying extruded rods and sections in brass, bronze, nickel silver and copper are brass and bronze stampings, antifriction metals, electrolytic copper powder, copper cathodes and solders.

Machine Units, Ltd., Mysto Works, Browning Street, Ladywood, Birmingham, 16. **A.605.**—Bakelite electrical accessories, ceiling roses, junction boxes, etc.

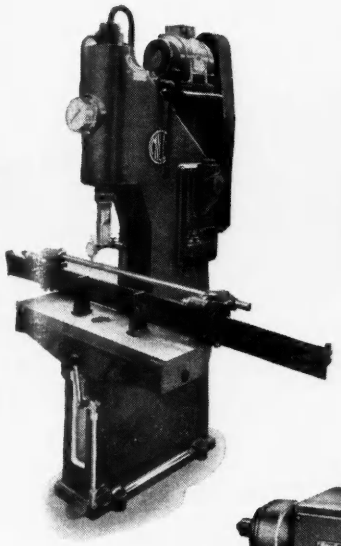
Macrome, Ltd., Macrome Road, Aldersley, Wolverhampton. **D.742.**—Engineers' cutting tools treated by the Macrome process have their resistance to wear greatly increased.

Mavitta Drafting Machines, Ltd., Highlands Road, Shirley, Birmingham. **D.714.**—Drafting machines range from the student's model to the " Major," which is capable of covering boards up to 50ft in length. A new isometric drafting machine is shown for the first time.

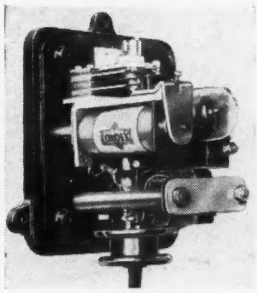
Measure Meter Co., Ltd., Milltown Street, Radcliffe, Lancs. **D.748.**—Automatic counting instruments for recording of work done on every type of machine.

Metal Processes, Ltd., 758–786, Kingsbury Road, Erdington, Birmingham, 24. **D.229.**—This company specializes in degreasing, rust-proofing and metal clad finishing.

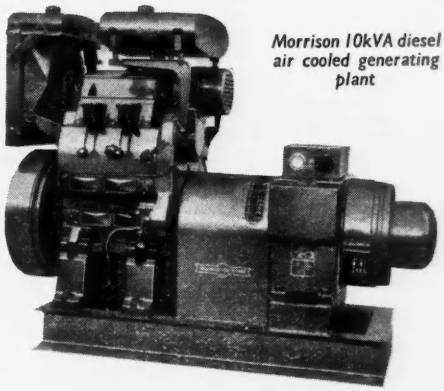
Metallisation, Ltd., Barclays Bank Chambers, Dudley. **Outdoor 134.**—Demonstrations are given of metal spraying



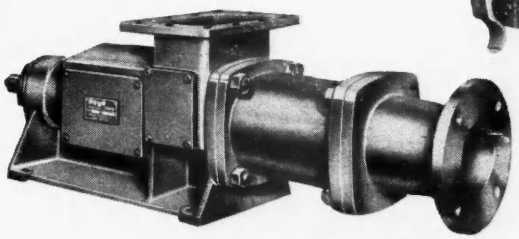
Mills "Oilaulic" 15 ton vertical press (above) with straightening equipment incorporated



Londex CCR electronic relay



Morrison 10kVA diesel air cooled generating plant



Linolite "MH" clip-on mirror fitting and (left) DM12 "Mono" pump for handling dry materials

equipment. A new lighting device is available for automatic metal spraying machines. A new process of hard facing combining metal spraying and welding is of special interest to engineers with problems of intense wear or corrosion.

Metropolitan Electric Cable & Construction Co., Ltd., Clyde Works, Chadwell Heath, Essex. **C.216.**—See Cable Makers' Association.

Midland Fan Co., Ltd., 212, Aston Road, Birmingham, 6. **A.622.**—A new 4ft wide water wash bench type spray booth is seen among compressor sets, spray guns, paddle blade centrifugal fans, high pressure blower fans and propeller fans.

Midlands Electricity Board, Mucklow Hill, Halesowen, nr. Birmingham. **C.509/408.**—See British Electrical Development Association.

John Mills & Co. (Llanidloes), Ltd., Railway Foundry, Llanidloes. **D.337.**—The "Oilaulic" 3 ton bench press, also made in 6 and 12 ton capacities, is suitable for innumerable applications in fitting and industries. An "Oilaulic" 15 ton standard vertical press with new lightweight straightening equipment (illustrated) is one of a standard range varying in capacity from 8 to 120 tons. Also on view are a 60 ton horizontal press and a 100 ton forcing press.

Mono Pumps, Ltd., Mono House, 1, Selforde Street, London, E.C.1. **D.716.**—The Mono pump can be successfully used for pumping liquids, viscous fluids and moist pulps. The new D12D pump (illustrated) is an addition to the "D" range of cast-iron pumps, while the new HM12BW pump for belt drive has been added to the "HM" series of domestic water pumps. "H" type stainless steel pumps are also exhibited.

Monsanto Chemicals, Ltd., 8, Waterloo Place, London, S.W.1. **C.617/516.**—Products chosen for display are "Lustrex" polystyrene for industrial plastic mouldings, "Aroclors" as capacitor impregnants and heat transfer media; "Pyroclor" as a transformer fluid; "Silesters," organic silicon chemicals for use in the foundry trade; "Permasan" and "Permasan" 116 for use in wood preservation; and sodium benzoate for corrosion inhibition. The reduced capacitor size made possible by the use of "Aroclors" is demonstrated, while the advantages are illustrated of "Pyroclor" as a transformer fluid of high fire resistance permitting the placing of transformers close to plant without the protection of special buildings.

Morgan Ebonite Co., Ltd., Herga House, Vincent Square, London, S.W.1. **D.615.**—Ebonite sheet, tube, rod, extrusions, etc.

B. O. Morris, Ltd., Briton Road, Coventry. **D.652.** — Flexible shaft machines, rotary files, polishing lathes, etc., include a new universal milling machine for medium and large batch machining of light alloy castings.

A. C. Morrison (Engineers), Ltd., Cliff Works, Burton-on-Wolds, Loughborough. **Outdoor 1326.**—Four new generating plants are exhibited: a 1,250 W, 230 V, a.c. belt drive generating plant powered by the new Petter PAZ 2½ b.h.p. air cooled diesel engine; a 3 kVA radiator cooled diesel generating plant which incorporates a Lister air cooled diesel 6/1 engine running at 650 r.p.m.; and 6 kW and 10 kVA diesel air cooled generating plants (illustrated). These and other units ranging from 450 W to 66 kVA capacity are seen in operation.

Morrison Automatic Pumps, Ltd., Loughborough. **C.231.**—A deep well turbo jet pump (illustrated) operates on the principle of a turbine pump actually on the surface of the ground, and a stationary jet (operated by water from the bypass of the pump) installed up to 450ft below ground. There are no moving parts and the only equipment requiring attention is the turbine pump above ground. Portable pumps, units for pumping petrol, industrial and domestic pumps are also represented powered by motors from ⅓ h.p. to 100 h.p.

Moss Gear Co., Ltd., Crown Works, Tyburn, Birmingham, 24. **D.428.**—Reduction gears, geared motors, etc.

Moulded Products, Ltd., Chester Road, Tyburn, Birmingham. **C.614.**—See National Plastics (Sales), Ltd.

Murad Developments, Ltd., Stocklake, Aylesbury, Bucks. **D.430.**—Capstan lathes, dustless grinders, electric motors, etc.

National Plastics (Sales), Ltd., Avenue Works, Walthamstow Avenue, London, E.4. **C.614.**—This selling organization for British Moulded Plastics, Ltd., and Moulded Products, Ltd., shows the various methods and materials used. Mouldings made from phenolic materials include a large television cabinet and a wide selection of electrical components. In the thermoplastic range is the "Solo" solder gun (illustrated) which is housed in "Diakon" mouldings, made for Budd & Weston (Special Machines), Ltd. Refrigerator doors and trays, radio cabinets made from shock resisting polystyrene, battery boxes made from bituminous materials and hard rubber and nylon mouldings are other exhibits.

National Time Recorder Co., Ltd., Easy Row, Birmingham, 1. **C.608.**—Time recorders, costing machines and clock systems.

James Neill & Co. (Sheffield), Ltd., Napier Street, Sheffield. **D.417/316.**—With "Eclipse" tools, hack saw blades, etc., are magnetic devices to accelerate production, including new permanent magnet chucks in the form of swivelling brackets, and magnetic adjustable links. The range of permanent magnets is increased by the introduction of three new power magnets.

Neville's (Liverpool), Ltd., Purley Way, Croydon. **D.121.**—See Aeronautical & General Instruments, Ltd.

New Welbeck, Ltd., 94, New Bedford Road, Luton. **C.208.**—Developed to enable cleaning operations to be carried

out at levels and heights usually inaccessible, the "Bak Vak" industrial suction cleaner (illus. 776) rests comfortably on the back of the operator.

Newton Brothers (Derby), Ltd., Alfreton Road, Derby. **A.327/226.**—Special electrical equipment includes automatic carbon pile voltage and current regulators, rotary transformers and convertors, alternators, power plant for radio and radar equipment and h.f. spinning motors for the rayon industry.

Northern Manufacturing Co., Ltd., Gainsborough. **D.319.**—Among a comprehensive range of individual gears and totally enclosed units are further developments of enclosed gear units designed for special applications.

Nutt Engineering Co., Ltd., Norwich Street, Cambridge. **A.319.**—The "Hayn" self-propelled lawnmower (illustrated) has six power driven cutting blades, safety switch control and insulated handles. Being made partly of high pressure cast aluminium it is both light and strong.

Oldham & Son, Ltd., Denton, Manchester. **C.414.**—The latest range of industrial lamps (illustrated) is contrasted with lights that have made industrial history over the past century. The new equipment includes an emergency lighting and shaft signalling supply unit for colliery winders, an Oldham-Wheat type cap lamp, inspection handlamps, a lamp designed to fit snugly to the body, a portable unspillable lamp for dangerous atmospheres, and a shunter's lamp. Industrial emergency lighting equipment is also represented.

Ormond Engineering Co., Ltd., Ormond House, Rosebery Avenue, London, E.C.1. **C.202.**—Hairdryers, toasters and repetition parts.

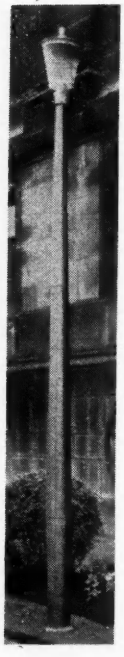
Osborn Manufacturing Co., Ltd., 5/13, Highgate Square, Birmingham, 12. **C.323.**—A robust new paint scraper (illustrated) incorporates a 750 W element and a stainless steel blade.

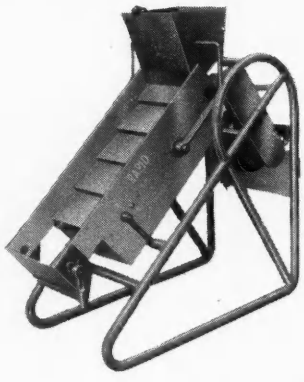
P.B. Sillimanite Co., Ltd., 4, London Wall Buildings, London, E.C.2. **C.622.**—Refractories, refractory cements, electrical insulation filling powders, electro-ceramics, etc.

W. H. Paul, Ltd., Breaston, Derby. **B.325/224.**—The "Aquadale" fully automatic dish washing machine (illustrated) takes approximately 48 pieces of crockery and 100 pieces of cutlery. A thermostatically controlled immersion heater is incorporated.

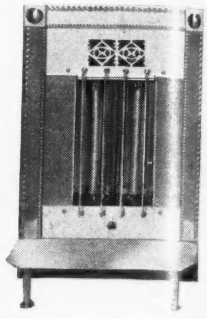
Permali, Ltd., Bristol Road, Gloucester. **C.618.**—Two new grades of "Permali" are now available: "TH" for h.v. in the tropics or elsewhere under operating conditions of high humidity; and "BH" which is resistant to most chemicals. The widespread use of grade "EH" is demonstrated by h.v. unearthed overhead line equipment, insulating block joints for railway use, an 11ft high 750 kV busbar support tripod, an 11 kV 250 MVA truck mounted oil circuit breaker, and other components of switchgear, transformers and generating machines (illustrated). "Dialam" h.v. bushings and terminals, "Permali" silent gear, bearings and other mechanically stressed parts are also on view.

Philidas Self-locking Nuts, Ltd., Ferrybridge, Yorks. **D.223/124.**—Self-locking nuts for the electrical industries are available in many types and in all the standard thread sizes.



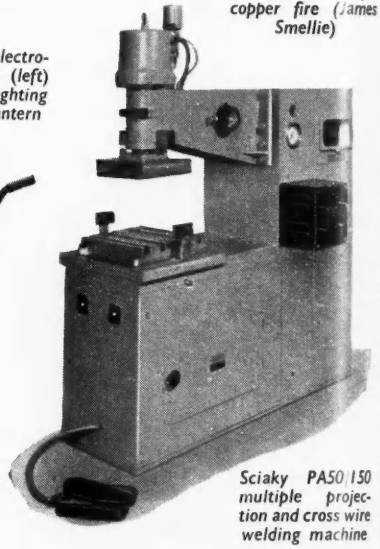


Rapid type V vibratory electromagnetic separator and (left) Poles Class B circular lighting column with post top lantern



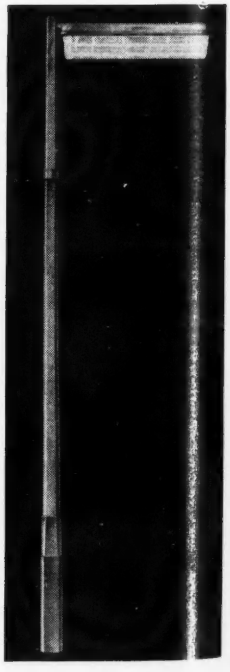
Hammered antique copper fire (James Smellie)

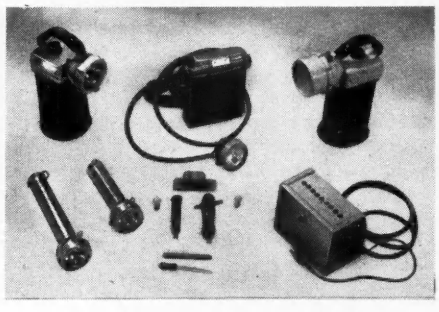
Nutt "Hayn" self-propelled electric lawnmower



Sciaky PA50/150 multiple projection and cross wire welding machine

Paul "Aquadale" dish washing machine





Oldham safety lamps for industry and (right) Revo "Scopas" lighting standard with new "Sol-eturn" lantern

Phoenix Sales, Ltd., Winton House, 11–13, St. Andrew Street, London, E.C.4. **A.699/504.**—Vacuum cleaners and floor polishers.

Pirelli-General Cable Works, Ltd., Southampton. **C.216.**—See Cable Makers' Association.

Planters Engineering Co., Ltd., 14, Craven Road, London, W.2. **D.636.**—In addition to a rubber milling machine there is a typical electrically operated baling press.

Poles, Ltd., Nickel Works, Tyburn Road, Erdington, Birmingham. **C.409 and Outdoor 1333/1232.**—The "Adastra" pole is supplied for telephone lines, l.v. and h.v. transmission, radio aerials, lighting purposes (illustrated), etc. Its sectional design combines the advantages of a tapered steel structure with maximum strength-to-weight ratio. It is easy to transport and erect, all sections being carried inside the base.

Pollard Bearings, Ltd., Ferrybridge, Knottingley, Yorks. **D.223/124.**—Among a comprehensive range of ball, roller and thrust bearings is the new self-lubricating plummer block and transmission equipment.

Power Centre Co., Ltd., Lloyd Street, Wednesbury, Staffs. **C.505.**—Industrial electrical distribution gear, overhead busbar, cable trunking and cable tap systems, busbar rising mains, busbar chambers, switchboards, cable boxes, sealing chambers, glands, etc., are among this company's products. Of special interest are the cable trunking sections produced in surface, floor and underfloor forms: by the use of internal fillets compartments are set up and maintained throughout the run. A small all-insulated metalclad busbar trunking has been developed with tap-off points at 2ft centres for use with fixed pattern fuse boxes.

Press Guards, Ltd., 372–8, Farm Street, Hockley, Birmingham, 19. **D.601.**—Guards for presses include electronic and fast sequentially operated types.

Pyrene Co., Ltd., 9, Grosvenor Gardens, London, S.W.1. **D.634.**—Fire extinguishing appliances.

Pyrotenax, Ltd., Hedgeley Road, Hebburn. **C.720.**—Mineral insulated copper covered cables include those used in power and lighting installations, for space heating and for thermo-electric applications, and there is an example of a rising main employing Pyrotenax cable. A section of concrete floor is heated in accordance with the latest practice. Examples of catenary wiring and concentric wiring are also shown.

Rainsford & Lynes, Ltd., Emily Street, Birmingham, 12. **B.604.**—Electrical accessories.

Ransomes Sims & Jefferies, Ltd., Orwell Works, Ipswich. **A.502 and Outdoor 1317/1216.**—Three types of electric fork lift trucks are capable of lifting 10 cwt, 30 cwt and 2 tons. Accessories include a crane attachment, load guard, overhead guard, 4ft 6in fork extensions and also the "Hydrum" load clamp with drum arms. Other exhibits include the T4 tractor (illustrated) for hauling loads up to 10 tons, the ENU8 truck with elevating platform, Legg battery chargers and a 25 cwt runabout crane.

Rapid Magnetic Machines, Ltd., Lombard Street, Birmingham, 12. **C.421.**—Special attention is drawn to a new swarf separator; a multi-separator for treating the more complex scrap, etc.; a portable foundry separator; an electromagnetic ore separator; a 20in dia lifting magnet; a flux controlled chute; and the small new "Ejecta" self-cleaning magnet. The "Magnahump" and "Magnatrap" can be included in gravity, pneumatic or hydraulic ducts, etc., for removing tramp iron from liquid, semi-liquid or dry fibrous products. Self-cleaning drum and pulley type separators, electro-magnetic clutches and brakes, an electro-magnetic percolator for the ceramic industry, a textile magnet, an overband extractor, electro-magnetic chute type separators, the new type "V" vibratory separator (illustrated) for treating fine powders, and the "Magnasweep" for collecting ferrous scrap from workshop floors are other exhibits.

Rawlplug Co., Ltd., Cromwell Road, London, S.W.7. **C.707.**—A special brick and concrete wall enables visitors to see demonstrations of the company's various fixing devices. Special attention is drawn to the masonry cutting speeds of "Durium" drills.

Ray Engineering Co., Ltd., Waterdale Works, Southmead, Bristol. **D.201 and 100.**—Switchboards and switchgear.

Revo Electric Co., Ltd., Tipton, Staffs. **Outdoor.**—At each entrance of the Fair is a representative range of street lighting columns and lanterns. Standards are shown in concrete, cast iron, and tubular steel, with lanterns for both tungsten filament and discharge lamps for Groups A and B roads. Intended for Group A roads, the "Scopas" standard in polished concrete (illustrated) carries a new type "Sol-etern" lantern for three 80 W 5ft fluorescent lamps. The lantern comprises an aluminium canopy and frame with polished reflectors and hinged one-piece "Perspex" cover.

Rheostatic Co., Ltd., Slough. **C.500.**—Automatic temperature control equipment includes "Satchwell" thermostats for the control of space heating, air conditioning, industrial processes and domestic apparatus. Among motorized valves for the control of steam, high pressure and low pressure hot water in "on-off," modulating and spring return types are new sizes. Other exhibits are primary firing controls for automatic boilers, mechanical stokers, and oil and gas burners. Associated with these controls are protective devices for gas and oil firing, including photo-cell electronic flame failure equipment for oil burners. This last type has been redesigned, and the accompanying picture shows the new appearance of the photo-cell head. Domestic controls include the "Satchwell V" thermostat for electric water heaters and stem and capillary tube type thermostats for electric cookers. Also on the stand are "Service" and "Satchwell" resistors used principally for controlling traction and industrial motors, for neutral earthing and loading.

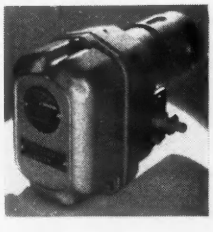
Ring Motors, Ltd., Ayres Road, Old Trafford, Manchester, 16. **D.644.**—Portable spot welding equipment.

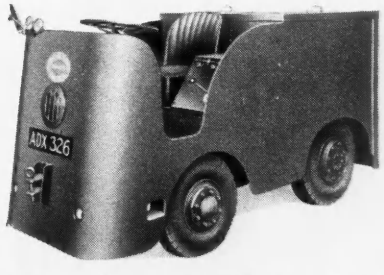
Rotherham & Sons, Ltd., Spon Street, Coventry. **D.624.**—Recording clocks, time delays, process timers, etc.

Rozalex, Ltd., 10, Norfolk Street, Manchester, 2. **D.706.**—Advice is given on combating dermatitis by the use of barrier creams.

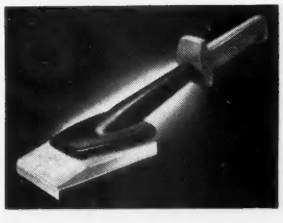
Rubber Bonders, Ltd., Dunstable, Bedfordshire. **D.650.**—Parts in rubber bonded to metal, flexible couplings, vibration and noise damping devices, etc.

Rubery Owen & Co., Ltd., Darlaston, S. Staffs. **D.717 616.**—Material handling equipment.

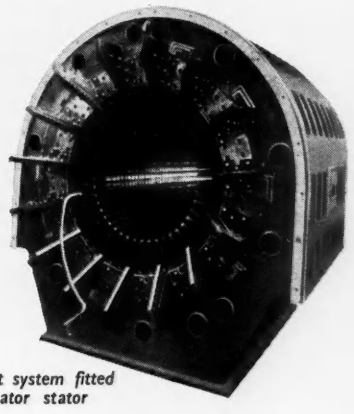




Rheostatic Company's "Satchwell" photo-electric control and (right) Ransomes, Sims & Jefferies T4 battery electric tractor



Osborn paint scraper with 750 W element



Permali winding support ring and bracket system fitted to an English Electric 30 MW generator stator

St. Helens Cable and Rubber Co., Ltd., Slough, Bucks. **C.216.**—See Cable Makers' Association.

Sciaky Electric Welding Machines, Ltd., Farnham Road, Slough. **C.222.**—The PA. 50/150 multiple projection and cross wire welding machine (illus. p. 778) has been developed for making a large number of welds on wire mesh simultaneously, both in the square and in line, and is arranged for automatic continuous feed-in to each line. The operating speed is approximately sixty feed-in movements per minute. The RAMU. 75 universal seam welding machine and the SAC. 25 spot and stitch welding machine are also shown.

Siemens Brothers & Co., Ltd., Woolwich, London, S.E.18. **C.216.**—See Cable Makers' Association.

Sigma Instrument Co., Ltd., Letchworth. **D.310.**—See Alfred Herbert, Ltd.

Silvercrown, Ltd., 178, Goswell Road, London, E.C.1. **C.221.**—With the "Mini," "Demi" and "Magna" tilting plating barrels, there is a totally immersed plating barrel. Resistance boards and control gear include remote control types. In addition there are a multi-cascade rumbling barrel, a centrifugal dryer, filter presses, mops, compositions, etc.

Skarsten Manufacturing Co., Ltd., 21, Hyde Way, Welwyn Garden City. **B.217.**—Besides an electric paint scraper this company makes a channelling tool for electricians.

James Smellie, Ltd., Ivanhoe Works, Oxford Street, Dudley. **B.628.**—Among fires in copper, bronze and stainless steel is a new model (illus. p. 778) in hand hammered antique copper. It is available in 2 or 3 kW sizes.

Frederick Smith & Co., 24, Queen Anne's Gate, London, S.W.1. **C.717.**—See London Electric Wire Co. & Smiths, Ltd.

Southern Instruments, Ltd., Fernhill, Hawley, Camberley, Surrey. **C.106.**—The "Minirack" E45 four-channel oscillograph (illustrated) is a general-purpose instrument making use of a four-gun cathode-ray tube. It has four direct-coupled driver amplifiers, a time-base and a time-marker oscillator, the necessary power panels being contained in a separate unit. It gives a visual display of simultaneous superimposed waveforms on a common time-base.

Sperryn & Co., Ltd., Moorsom Street Works, Birmingham, 6. **D.543.**—Flame failure switches, lampholders, ceiling roses, etc.

Spiral Tube & Components Co., Ltd., Osmaston Park Road, Derby. **D.710.**—The "Spiraluxe" all-electric unit heater (illustrated) is of attractive design incorporating automatic thermal cut-out and built-in switch. It is available in 2 kW and 3 kW ratings, for wall or floor mounting. Thermostats can also be supplied separately. Other types of unit heaters are also represented.

Standard Telephones & Cables, Ltd., Connaught House, Aldwych, London, W.C.2. **C.615/514.**—Telecommunication equipment similar to that used during the Coronation includes a portable micro-wave radio television link, a mobile automatic direction finding equipment, a sample of the London-Birmingham television cable, microphones and loudspeakers.

Sterling Cable Co., Ltd., Aldermaston, Berks. **C.308.**—In addition to general types of cable there is a full range of polythene insulated and sheathed telephone distribution cable; similar types having a further mechanical protection of wire armour and an outer polythene sheath; plastic insulated, armoured and sheathed multi-conductor control cables; and polyethylene sheathed aluminium conductors for low voltage overhead systems, together with telephone and control cables. Jointing accessories are also represented.

E. W. Stockham, Ltd., 18, Camden Street, Birmingham, 1. **B.628.**—Lighting fittings and shades include the "Touchlite" bedside lamp.

Stothert & Pitt, Ltd., Bath. **Outdoor 1101/1000.**—Concrete batching and mixing plant, vibratory concrete compacting and finishing machines, etc.

W. & S. Summerscales, Ltd., Parkside Works, Keighley. **A.521.**—The new Scales "Fairy" washing machine (illustrated) has a capacity of 8 lb of dry clothes and incorporates a rotator type agitator. The 12in hand wringer folds down into the tub when not in use. Rollers and a vitreous enamel table top are supplied with each machine.

Sumo Pumps, Ltd., Lighthouse Works, Smethwick, 40. **B.309/208.**—See Chance Brothers, Ltd.

Taylor & Challen, Ltd., Derwent Works, Birmingham, 19. **D.415.**—Presses exhibited include coining, notching, and double-action drawing types. (Illus. p. 767)

Telegraph Construction & Maintenance Co., Ltd., Telcon Works, Greenwich, London, S.E.10. **C.216.**—See Cable Makers' Association.

Herbert Terry & Sons, Ltd., Redditch. **B.424.**—Besides "Anglepoise" lamps this display includes such items as presswork, springs, flexible shafting, spring washers and hose clips.

Thermat, Ltd., Baldwin House, 132, Arkwright Street, Nottingham. **C.513.**—Electrically heated blankets and pads.

Bertram Thomas (Engineers), Ltd., Worseley Street, Hulme, Manchester. **D.309.**—Electric dinner wagons, car heaters, d.c. switchboards, high speed circuit breakers, relays and automatic control equipment.

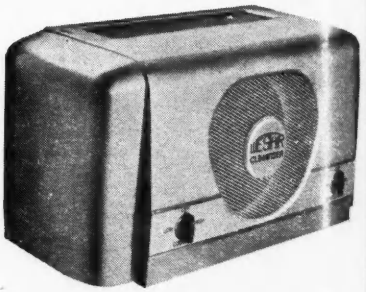
Joseph Tomey & Sons, Ltd., Catherine Street, Aston, Birmingham, 6. **D.703.**—Gauges, switches, thermometers, etc.

Triangle Products, Ltd., Greencroft Mills, Manchester Road, Hyde, Cheshire. **D.155.**—Arc welders from 100 A upwards include the portable "Spot-Gun" and "Monoflex" models.

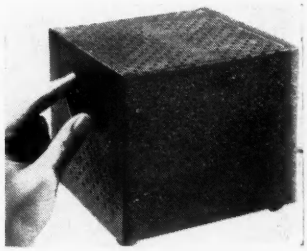
Trico-Folberth, Ltd., Great West Road, Brentford. **C.318.**—Heavy duty windscreen wiper equipment, an omnibus direction indicator, and horn equipment are examples of vehicle apparatus shown.

Ronald Trist & Co., Ltd., Bath Road, Slough, Bucks. **D.322.**—"Thermofeed" feed regulators; "Hilo" alarms; "Mobrey" controls, level switches and governors; "Electricon" smoke density indicator; and photo-electric cells.

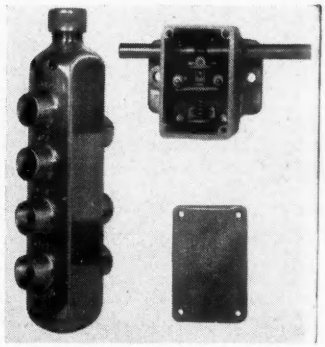
Trumeter Co., Ltd., Milltown Street, Radcliffe, nr. Manchester. **D.748.**—The standard range of counters and measuring instruments has been modified. A fully automatic predetermined counter with motor driven reset (illustrated) can be used for batch counting as well as for measuring predetermined lengths continuously. Of special interest is a photo-electric cell counting installation with many applications.



Westool "Westair" climatizer



Walter ozonizer

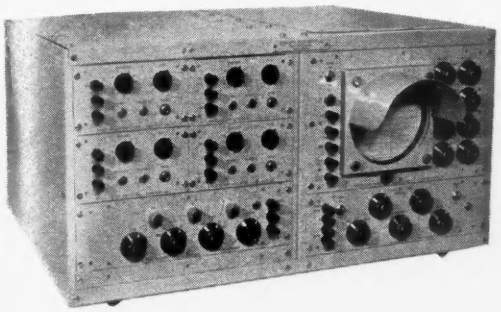


Wilkinson pendant and limit switches

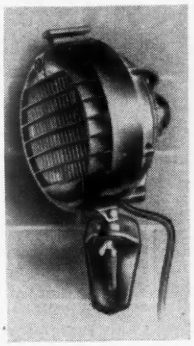
Tufnol, Ltd., Perry Barr, Birmingham, 22B. **C.613/512.**—Besides "Tufnol" non-metallic material in sheet, tube and rod, there are examples of Tufnol components such as gear wheels, bearings, electrical insulators, vehicle parts, corrosion resisting articles, etc. Of special interest are water lubricated bearings; a terminal board produced from "Kite" brand sheet and tube; moulded bell, ball and barrel insulators for voltages of up to 660 V; and a h.v. fuse with the body and other insulated parts made of Tufnel (illustrated).

Turner Brothers (Birmingham), Ltd., Galvanic Works, Cliveland Street, Birmingham, 19. **D.512.**—Press tools, jigs, power presses, etc.

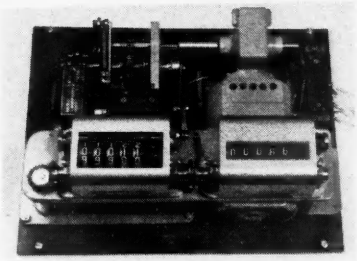
Turton Brothers & Matthews, Ltd., P.O. Box 40, Wentworth Street, Sheffield, 6. **D.413.**—"Torpedo" permanent magnets cover a wide range of types and qualities according to the purposes for which they are required.



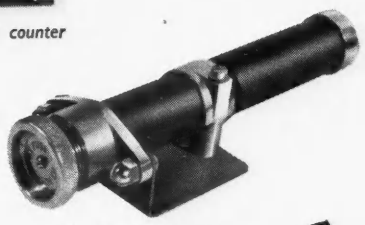
Left: Southern Instruments "Minirack" four channel oscillograph



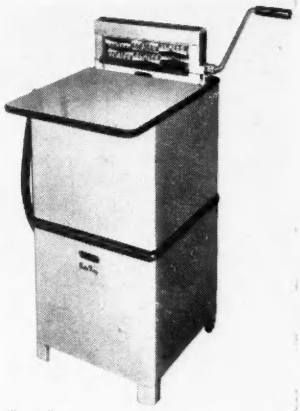
Spiral Tube wall mounting fan heater

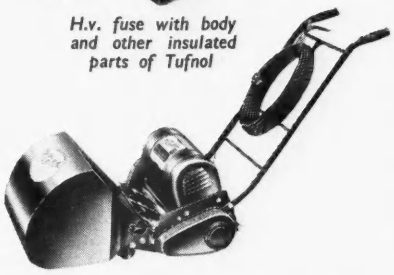


Trumeter automatic predetermined counter with resetting unit



H.v. fuse with body and other insulated parts of Tufnol





Summerscales "Fairy" washing machine and (right) Webb 12in self-propelled lawnmower

Ultrasonics, Ltd., Westgate, Otley, Yorks. **D.220.**—Ultrasonic homogenizers and drills; liquid flow regulators.

United Ebonite & Lorival, Ltd., Little Lever, nr. Bolton, Lancs. **C.301.**—Plastic and hard rubber compression and injection mouldings, p.v.c. sheeting and extrusions, hard rubber battery containers, etc., include a "collapsible" plastic television cabinet.

Vactite Wire Co., Ltd., 24, Queen Anne's Gate, London, S.W.1. **C.717.**—See London Electric Wire Co. & Smiths, Ltd.

Vane & Schofield, Brighton Road, Birmingham, 12. **Outdoor 1311/1210.**—Greenhouse heater and cooler unit.

Walker Fender Co., Ltd., Sherborne Street, Ladywood, Birmingham, 16. —**A.331.**—Table and floor standards.

J. & H. Walter, Ltd., 31a, Farm Lane, Fulham, S.W.6. **C.705.**—The Walter "No-cord" ironing unit, a clothes dryer and a domestic ozonizer are accompanied by a new industrial ozonizer (illustrated) available in single and two unit models giving normal air purification for up to 4,000 and 8,000 cu ft or deodorizing up to 2,000 and 4,000 cu ft respectively.

Walters, Austin, & Son, Ltd., Ayres Road, Old Trafford, Manchester, 16. **D.644.**—Transformers, rectifiers, condensers, chokes, etc.; also shelving.

H. C. Webb & Co., Ltd., Tame Road, Witton, Birmingham, 6. **A.511.**—In the new 12in self-propelled lawnmower (illustrated) the electric motor can be used to drive either the whole machine or, for manœuvring in confined spaces, the cutting cylinder only.

Wellman Smith Owen Engineering Corporation, Ltd., Darlaston, S. Staffs. **D.626.**—Solenoid actuated air control valves.

Wellworthy, Ltd., Lymington, Hants. **D.545/442.**—"Wellseal" jointing compound and examples of the "Al-Fin" bimetallic bonding process are items of electrical interest.

Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London, N.1. **C.508 and Outdoor 1341/1240.**—A barrier machine, designed as an alternative to the heavier type of entrance or level crossing gate, has a barrier arm, which carries special warning lamps fitted with dioptric lenses to give all-round visibility. It is individually or automatically operated by a 24 V d.c. supply from a Westinghouse rectifier set. A short range colour-light signal as used for mine signalling is also shown. The whole of the three-phase power requirements on the stand come from a bank of phase convertors, operating from single-phase mains. Rectifier units include radio and television types, and units capable of operation in temperatures of up to 70 deg C. New battery chargers have an extended range of charging rates. A demonstration of the "Dalic" plating process incorporates a small lathe and a magnetic chuck, both deriving their d.c. from a "Westalite" transformer/rectifier set. The new type 960 "Westruk" is of interest to airline operators.

Westool, Ltd., St. Helens, Auckland, Co. Durham. **C.312.**—This exhibit deals with various applications of solenoids which are available for a.c. performances of 1 lb pull or thrust at 1in stroke up to 20 lb at 1¾in stroke, pull type only, and for d.c. up to 300 lb at 5in stroke, pull and thrust types. Warner electric motion control brakes, clutches and clutch couplings, previously obtainable only from the U.S.A. but now manufactured in this country, are shown for the first time. The "Westair Climatiser" air conditioner (illustrated) is also now made in this country. A further product is coil winding machinery.

Whitecross Co., Ltd., Warrington. **D.621.**—Bright, annealed, coppered, galvanized, tinned and shaped wires include conductors and welding wires.

Wilkins and Mitchell, Ltd., Darlaston, S. Staffs. **C.517.**—"Servis" washing machines, refrigerators and rotary ironers.

W. Wilkinson & Co., Bedford Street North, Halifax. **C.716.**—Pendant and limit switches (illustrated) are in aluminium cases. The former has silver contacts and its case is polished to enhance the appearance. Also on show are bell pushes, spraying jets and nozzles, push-button controls, and various small parts.

Williams (Birmingham), Ltd., Westwood Road, Witton, Birmingham, 6. **A.312.** — Hotplate utensils for electric cooking.

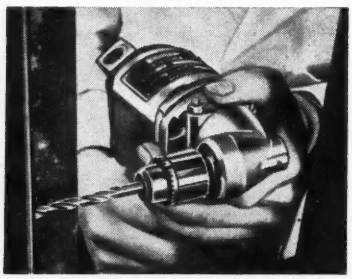
Wilmot Breeden, Ltd., Amington Road, Birmingham, 25. **C.302.**—Refrigerator and domestic appliance components.

Wire Drawing Dies (Manchester), Ltd., Adelphi Ironworks, Salford, 3, Lancs. **D.167.**—Dies, extrusion bushes, plugs, mandrels, etc.

Wireohms, Ltd., Baldwin House, 132, Arkwright Street, Nottingham. **C.513.**—Mica and ceramic heating elements.

Wolf Electric Tools, Ltd., Hanger Lane, London, W.5. **C.603/502.**—A 3in portable electric belt sander and a heavy duty precision valve refacer are new products. Portable electric saws are represented by two models, one with a capacity of 2⅛in and a bevel cutting capacity of 2in, and the other saw for heavy duty ripping and cross cutting, with a cutting depth of 3½in or 2⅜in for bevel cuts. The combined mortiser and drill for up to ½in in hardwood can be converted into a

bench drill press or ⅜in portable heavy duty drill. Drills from ¼in to 1¼in capacity (illustrated), screwdrivers, sanders, blowers, 6in and 8in bench and pedestal grinders,

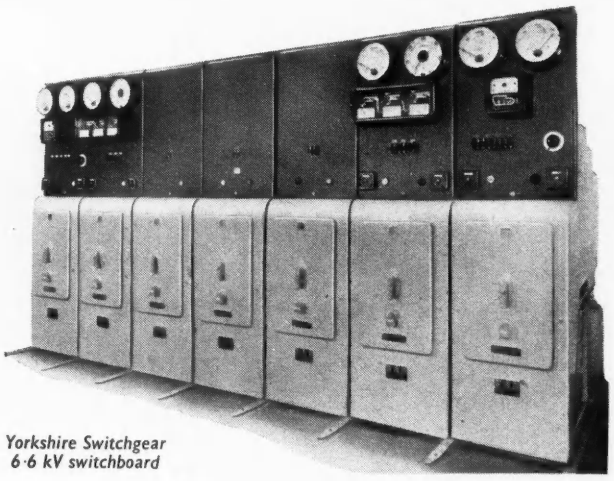


Wolf drill with angle attachment

portable grinders, flexible shaft grinders and a die grinder kit, hammer and wall-plugging kit, solderguns and soldering irons are also displayed. A fretsaw attachment adds another accessory to the " Cub " range.

Wolseley Sheep Shearing Machine Co., Ltd., Wolseley Works, Electric Avenue, Witton, Birmingham, 6. **D.713 and Outdoor 1315/1250.**—Demonstrations show the speed with which electric fencing equipment can be moved in the field. An improved design of bell fencer is shown together with a new reel and strainer, the " Pigtail " post and an air-depolarizing dry battery operating the fence for at least six months day and night. Sheep shearing, cattle and horse clipping machines, and dairy equipment are other products.

Woodmet, Ltd., Globe Lane, Dukinfield, Cheshire. **C.209.**—Transformers and electrically heated trolleys.



Yorkshire Switchgear 6·6 kV switchboard

Wynn Timmins & Co., Ltd., Century Works, Commercial Street, Birmingham, 1. **D.118.**—Telegraph and linesmen's tools.

Yale & Towne Manufacturing Co., Waddenbrook Lane, Wednesfield, Staffordshire. **D.305/204.**—Materials handling equipment includes electric hoists, chain blocks, trolleys, cranes, etc.

Yorkshire Copper Works, Ltd., Leeds. **B.723/634.**—Large coloured photographs of ships, power stations, oil refineries, refrigeration plant, etc., depict the wide range of industries using " Yorkshire " non-ferrous tubes and " Yorkshire " fittings. A special display of tubes for power stations comprises condenser tubes in 70/30 brass, " Yorcalbro," " Yorcoron " and 70/30 cupro-nickel; " U " tubes for feed water heaters; hydrogen cooler tubes; and tubes for air and oil coolers, evaporators, feed water heaters, air ejectors, etc.

Yorkshire Switchgear & Engineering Co., Ltd., Meanwood, Leeds, 6. **C.419.**—Examples of 6·6 kV and 11 kV switchgear for indoor and outdoor service (illustrated) are accompanied by switch-fuse gear with three-phase features. Isolators are also represented.

Zinc Alloy Rust-Proofing Co., Ltd., Shakespeare Street, Wolverhampton. **B.726.**—A technical information bureau provides particulars of rust-proofing by the sherardizing process.

EXHIBITS IN LONDON

Abrahams & Co., Ltd., Brama Works, Spring Street, Birmingham, 15. **K.216.**—Table lamps of a wide range of designs include types with pottery, wooden, glass and chromium plated bodies. Of special interest are an 8in by 4in flaked glass cylindrical model (illustrated) and various pillar designs with plain, ribbed and " flame " globes.

Andrew & Co., Ltd., 102, Hatton Garden, London, E.C.1. **K.604.**—" Anvil " chiming and striking clocks.

Barrywald Products, Ltd., 1, Leadenhall Street, London, E.C.3. **B.42.**—See Saniguard Appliances, Ltd.

L. M. Beasley & Co., Ltd., 8, Stafford Road, Caterham. **M.28.**—Floor and table standards in various finishes, decorative pottery lamp bases and lampshades.

Bellhouse & Binney, Ltd., De Flora Works, South Milton Street, Plymouth. **M.92.**—Hand painted table lamps and lampshades.

Bellow Machine Co., Ltd., Leeds, 7. **Earls Court Q.280.**—Among the latest high speed electric cutting, sewing, pressing and other clothes making machinery are an automatic cloth laying machine, new power driven individual mobile unit stands for machine mounting, hand cloth cutting machines, a portable steam-ironing unit, and various sewing machines.

Bentima Co., Ltd., 18, Bury Street, London, E.C.3. **K.312/404.**—Synchronous electric chiming clocks.

Blick Time Recorders, Ltd., 96–100, Aldersgate Street, London, E.C.1. **G.16.**—A comprehensive range of time control equipment includes time recorders for all sizes of factories, time recorders for job costing, time stamps, watchman's clocks, sound signal systems, staff location systems, and master clocks. The " Autoclip " fully automatic electrically driven time recorder (illustrated) combines the advantages of the Blick two colour " Clip " recorder with those of one hand operation.

Chas. F. Bristol & Son, Ltd., 17/19, Lench Street, Birmingham, 4. **M.95.**—Additions to the range of " Flosmaron " table lamps embody shades in various materials.

British Manufactured Bearings Co., Ltd., Crawley. **N.42.**—Miniature precision ball bearings.

Castelco (Great Britain), Ltd., Castle Works, High Street, Old Woking. **M.25.**—These manufacturers of precision switches for a wide range of electrical appliances specialize in coloured switches for table lamps, floor standards, etc.

Chelton (Electrostatics), Ltd., Marlow. **B.3.**—Aircraft radio masts, cable and components for insulated aerials, static dischargers, etc.

Chilton Electric Products, Ltd., Hungerford, Berks. **K.117.**—Accompanying the " Buk " and " Kub " electric shavers is the redesigned universal shaver socket, providing for 110 V American (flat pin), 165 V Continental (thin pin) and up to 250 V British (standard pin) plugs.

L. & I. Clarke, 10, Colebrook Road, Southwick. **M.73.**—The " Versatile " all metal table lamp (illustrated) folds into a box approximately 6in by 4in by 4in. Available in about twenty-four different colours, it is fitted with clips for attachment to bedhead, chair-arm, etc.

Counting Instruments, Ltd., 5, Elstree Way, Boreham Wood. **B.13.**—Electromagnetic counters are made to customers' specifications.

Geo. Davidson & Co., Ltd., Teams Glass Works, Gateshead, 8. **L.27.**—Industrial and lighting glassware.

Elliott & Spear, Ltd., Oakhill, Hildenborough, Tonbridge. **M.19.**—Table lamps.

English Clock Systems, Ltd., 179, Great Portland Street, London, W.1. **K.315/401.**—Electric clocks, proces

ti ers, time recorders, tower clocks, bell co trols, etc.

nglish Numbering Machines, Ltd., Queensway, Ponders End, Enfield, Middlesex. **B.22.**—A complete range of numbering machines is available.

Fillerys (Great Britain), Ltd., 101–105, Ladbroke Grove, London, W.11. **Earls Court V.2.**—The company's combined scrubber, vacuum cleaner and floor polisher has been considerably improved and by means of simple adjustments now scrubs carpets. Other products shown are the "step-climbing" cleaner and the "Hi-Speed" light-weight three-brush polisher scrubber.

Foster Transformers, Ltd., South Wimbledon, London, S.W.19. **B.37.**—Among transformers are complete scientific units for research work containing high voltage transformers, constant voltage transformers, voltage regulators and small transformers for special purposes. Automatic voltage regulators are demonstrated together with the recently introduced electronic constant voltage transformer (illustrated). A new slider type automatic voltage regulator is shown together with standard types of automatic voltage regulators.

General Signal & Time Systems, Ltd., 73, Great Peter Street, London, S.W.1. **K.408.**—Clocks, staff location equipment, industrial timing systems, public address equipment, neon signs, animated signs, etc.

Gestetner, Ltd., Aldwych House, London, W.C.2. **G.24.**—Electrically operated duplicating machines.

Grampian Reproducers, Ltd., Hanworth Trading Estate, Feltham. **B.11 16.**—A range of amplifiers, loudspeakers, microphones, etc., is suitable for various types of public address and sound installations. A new item is a 100 W amplifier (illustrated).

David Griffin, Ltd., Wimborne Road, Poole. **Earls Court Q. 52.**—"Dee Gee" electric blankets include a baby's size. Babies' bottle warmers are also shown.

A. Hurst & Co., Ltd., 54a, Tottenham Court Road, London, W.1. **Earls Court V.3.**—This company acts as agents for Kenwood food mixers, liquidizers and steam irons; "Limit" fans; "Smoothie" travelling irons; "Bestfrend" hairdryers and "Mastercook" grillers.

Hyders, Ltd., 10, Fitzroy Street, London, W.1. **M.21.**—This company specializes in wrought iron lighting fittings.

Insulations & Constructions, Ltd., St. John's Works, Penn, Bucks. **Earls Court T.4.**—"Cresta" food preparation machines are shown here with refrigerators from 1½ to 4 cu ft capacity, veneered or enamel finished.

Jennings Organ Co., Ltd., Unity Works, Dartford Road, Dartford, Kent. **C.23.**—The "Univox" J.6 de luxe model clips quickly to piano or organ and does not affect the normal working of the instrument to which it is attached. It can also be played separately on a tubular stand. An incorporated sub-octave coupler simultaneously couples the fundamental note played to the octave below. The model shown introduces automatic repetitive banjo, mandolin and novel percussive string effects. The J.51 professional streamline organ gives many novelty effects in addition to the normal full range of organ and orchestral tones. It has an output of 40 W. Several other electronic instruments are exhibited.

K.X. Lamps, Ltd., East Middlesbrough Industrial Estate, Southbank Road, Cargo Fleet, Middlesbrough. **M.47.**—Low voltage lamps (under 24 V) cover tram, bus, car, cycle, yacht, radio, and flash light bulbs. Christmas decoration sets and neon cruciform and religious lamps are also represented.

Kego Electric Co., Ltd., Mount Pleasant, Wembley. **M.81.**—Lighting fittings and lampshades.

Walter Lambert, Ltd., 7, Glamis Street, Bognor Regis. **M.95.**—"Exquisart" lampshades include contemporary styles.

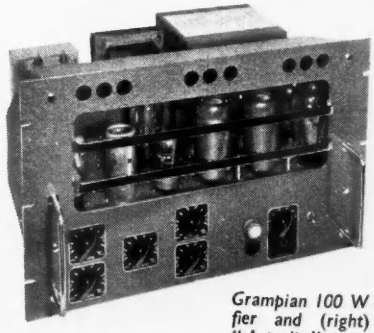
Lan-Elec, Ltd., 220, Bedford Avenue, Slough. **Earls Court T.12.**—Semi-automatic gravity feed food slicing machine.

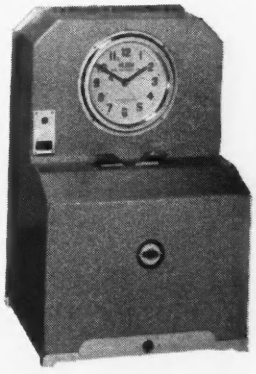
Loma Electronic Equipment, Ltd., 27–29, Union Street, Southwark, London, S.E.1. **B.27.**—"Metaltector" equipment affords a completely automatic inspection for the detection of metal, ferrous or non-ferrous, in any non-metallic material. The type 1B apparatus has taken the place of the multi-channel equipments where a number of small heads are required. Applications range from food to textiles.

Miller Organ Co., Ltd., Osborne Buildings, Temberhill, Norwich. **C.21.**—Electronic organs, church bells and carillons.

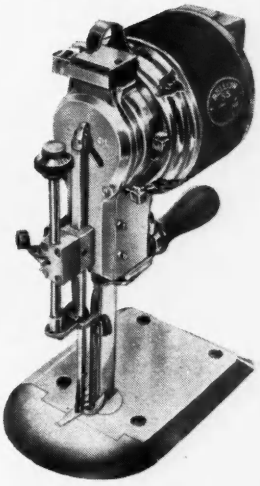
Modern Telephones (Great Britain), Ltd., 101, Tottenham Court Road, London, W.1. **G.28.**—Internal push-button telephone systems can be supplied with executive loudspeaker master stations and "speech without hands" facilities.

National Cash Register Co. (Manufacturing), Ltd., 206–216, Marylebone Road, London, N.W.1. **G.20.**—This

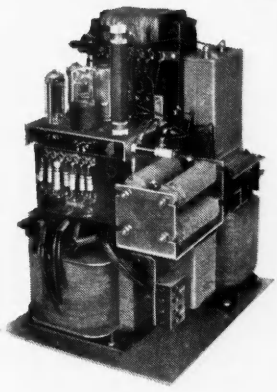




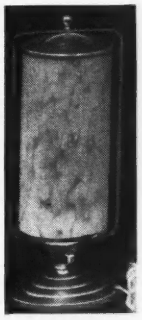
Grampian 100 W amplifier and (right) Blick "Autoclip" time recorder



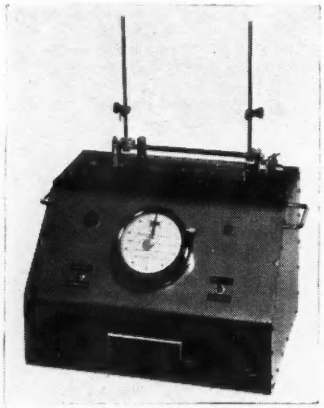
Bellow cloth cutter and (below) the L. & I. Clarke "Versatile" table lamp



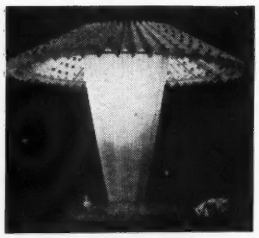
Foster 500 kVA electronic constant voltage transformer



Pifco hairdryer and (left) Abrahams E.149 flaked glass cylindrical table lamp



Shaw wire fatigue tester



Sterling table lamp

company makes cash registers, accounting and adding machines, and electric credit sanction systems.

New Welbeck, Ltd., 94, New Bedford Road, Luton, Beds. **Earls Court V1.**—See Birmingham Section.

James North & Sons, Ltd., Godley Mills, Hyde, Cheshire. **Q.14.**—P.v.c., fabric supported, industrial gloves and clothing are among this company's protective clothing.

Perihel, Ltd., Edge Street, London, W.8. **B.23.**—Features of the "Deep Ray" infra-red heater are its wide radiation, deep penetration, safety, compactness, wide application, ease of handling and low cost. Also displayed are the "Actina Portable Sun," the "Pira" table model and the "Mixray" model.

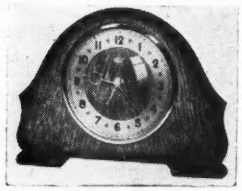
Pifco, Ltd., Watling Street, Manchester, 4. **B.10.**—Domestic electrical appliances and accessories include massagers, hairdryers (illus. p. 783), shaving and make-up mirrors, tea-making apparatus, infra-red and sun lamps, table lamps, night lights, fairy light sets and torches. Electric blankets are shown for the first time.

M. Preston & Co. (Electrical Manufacturers), Ltd., 125, Grosvenor Avenue, Highbury, London, N.5. **M.23.**—Modern and period lighting fittings include wall brackets, table lamps, and floor standards in numerous finishes.

Pullars Instruments, Ltd., Hollingbury Road, Brighton, 6. **K.315/401.**—Second and minute timers and timing switches.

Pye, Ltd., Radio Works, Cambridge. **Earls Court Everest Court 20/21.**—Radio and scientific instruments.

Richard Quinnell, Rowhurst Forge, Oxshott Road, Leatherhead, Surrey. **M.16.**—Lighting fittings.



Smith's "Morton" clock

Rose Brothers (Gainsborough), Ltd., Albion Works, Gainsborough, Lincolnshire. **G.15.**—Automatic wrapping, packaging, filling and labelling machinery.

Rotosigns, Ltd., 207, Victoria Street, London, S.W.1. **B.45.** — Electrically operated display apparatus.

Rudman Darlington (Electronics), Ltd., Wednesfield. **B.44.**—With the new Series P industrial and scientific magnetic tape recorder is a multi-channel instrument recorder giving up to eight tracks simultaneous recording, with a frequency response of 100 c/s to 15 kc/s ± 3 db at 7½in per second and 100 c/s to 20 kc/s ± 3 db at 10in. A similar instrument has a response from zero to 250 c/s.

Saniguard Appliances, Ltd., 62, London Wall, London, E.C.2. **B.42.**—This company is the distributor of the "Barrywald" electric sanitary incinerator.

Henri Selmer & Co., Ltd., 114–116, Charing Cross Road, London, W.C.2. **C.20.**—The "Clavioline" electronic keyboard has a three octave range, extended by couplers to five octaves. Eighteen stops reproduce the tones of all orchestral instruments.

Shaw Electronics, 31, Market Street, Bradford, Yorks. **B.31.**—A new wire fatigue tester (illustrated) enables a complete stress-fatigue characteristic to be determined for even very fine spring steel wire. As an indication of speed of operation a result for 29 s.w.g. spring steel wire, with a length of approximately 5in, is obtained in 30 sec. The instrument is suitable for both ferrous or non-ferrous wires.

Singer Sewing Machine Co., Ltd., City Road, London, E.C.1. **Earls Court Q.9/35.**—A comprehensive display of electric sewing machines is on view.

Smiths English Clocks, Ltd., Sectric House, Waterloo Road, Cricklewood, London, N.W.2. **K.315/401.** — New designs of "Sectric" clocks (illustrated) augment the wide range already available. Special movements are available for export to countries where voltages are different from those in this country.

Speights, Ltd., Classic Works, Mill Road, Dewsbury, Yorks. **M.54.**—Lighting fittings.

Sterling Light Co., 50, Ledbury Road, London, W.11. **M.12.**—A table lamp (illustrated) has been added to the range of ceiling and wall lighting fittings, which fold up for packing, are easily fixed and are washable.

Stokes Fountains, Ltd., 185–187, London Road, Croydon. **M.6.**—Fountains for garden, aquarium and table require no mains water supply and do not incorporate any rotary parts liable to wear out. No lubrication is necessary.

Televox (London), Ltd., 5, Bourne Street, Sloane Square, London, S.W.1. **G.10.**—Amplifiers to give external telephone calls at loudspeaker strength are made in six models each housed in a cabinet 10in by 7in by 6in, including the recess in which the telephone handpiece rests. Types are available for amplification of both incoming and outgoing voices, inter-office communication, and for enabling the hard-of-hearing to telephone with ease.

Veeder-Root, Ltd., Kilspindie Road, Dundee. **B.25.**—Counting mechanisms are manufactured for all branches of industry and for all types of equipment. Both high speed and low speed magnetic counters are available. The six-figure reset general purpose magnetic counter (maximum speed 800 counts per minute) is used mainly for remote control indication by a switch actuated either by the articles to be counted or by the machine to which it is applied.

Vidor, Ltd., West Street, Erith, Kent. **Earls Court Everest Court 3.**—Radio sets, dry batteries for radio sets, hearing aids, and domestic appliances.

Warmex, Ltd., 375, Milton Road, Cambridge. **M.69.**—Electric blankets incorporate thermostatic control and new illuminated safety bedside switches.

BRITISH ASSOCIATION MEETING

THE preliminary programme for this year's meeting of the British Association for the Advancement of Science at Oxford (1st to 8th September) is now available from the secretary at Burlington House, Piccadilly, London, W.1. The full programme, giving detailed arrangements, will be published during the week ending 7th August and will be sent to all who intimate their intention of attending.

The inaugural general meeting will take place in the Sheldonian Theatre on the evening of Wednesday, 1st September, when the President, Dr. E. D. Adrian, O.M., P.R.S., will deliver his address on "Science and Human Nature." This meeting is expected to be preceded by a convocation for the conferment of honorary degrees by the University of Oxford.

The president of Section G—Engineering is Dr. Willis Jackson, F.R.S., and his address on 3rd September will be entitled "New Materials in Engineering." Sir John Cockcroft, K.C.B., C.B.E., F.R.S., is president of Section A—Mathematics and Physics and his address, "Recent Developments in High Energy Physics," will be delivered on 2nd September. A large number of excursions, tours and visits to places of interest in the Oxford area have been arranged, together with the customary complement of social functions.

Entering a New Overseas Market

How Commercial Diplomatic Officers Can Help

By E. M. PARTRIDGE

(H.M. Superintending Trade Consul at Chicago)

FEW firms can properly use the fine old phase "Agents in all the principal cities of the world," yet it is true, in a special sense, of every manufacturer and exporter in the United Kingdom. In the larger industrial and commercial centres of Commonwealth and Empire countries these "agents" are the Trade Commissioners and United Kingdom Trade Correspondents; in other countries they are the consular and commercial officers of H.M. Foreign Service, all serving their principals, the manufacturers and exporters, through the Board of Trade.

In most export trades, success depends on the appointment of a good sales representative or distributor in the overseas market. The most important function of the commercial officers is accordingly to help exporters find the representative best suited to their trade. Their task is to bring exporter and agent together in a lasting, profitable relationship. The story of how one such relationship developed will illustrate how commercial officers can help and the limits within which they work. It is a true story, in the sense that it is a mosaic made up of many incidents.

Although this article is based on experience in North America and does not necessarily apply to all kinds of electrical products, it is a useful general indication of services which are offered by the commercial diplomatic service and how manufacturers may benefit from using them

Having decided to try to break into a new overseas market and to employ an agent, a manufacturer looked first at the possibilities in North America. The limited volume of available supplies suggested investigation only in Canada but it was desirable to look at the prospects in at least two markets so as to have an opportunity to choose the best alternative. He discussed the problem with the local Regional Controller of the Board of Trade who quoted reports coming from commercial officers in the United States which demonstrated that the market could be successfully tackled piecemeal, one area at a time and, in fact, that it was frequently best to do so. The Regional Controller offered to set inquiries in motion in both countries.

The manufacturer took away with him an "agency inquiry form." After completion and return, photostat copies of the form were sent by the Board of Trade to the British Embassy in Washington and to the seven Trade Commissioner posts in Canada. Washington sent copies to the four consular posts in the United States where prospects were best. Work began simultaneously and in the same way in all eleven places. The form called for a description of the product and for an indication of its special merits. For the sake of brevity, the manufacturer had supplied illustrated brochures with the completed form to serve as a description, but the commercial officer's work would have been greatly assisted had the manufacturer amplified the description by indicating, for example, what success had been achieved in the home market, which of the "selling points" emphasized in the brochure distinguished the product from its competitors, what were the special functions in which it excelled, and so on.

Each commercial officer had a number of copies of the illustrated brochure and would be able to save time by inviting the most likely agents to consider the prospects simultaneously. It would have helped to have had samples to show to the agents but the product was not one which permitted dispatch of as many samples as illustrated brochures.

The first question a prospective agent would ask was how much the product would cost delivered in the city. The manufacturer had quoted dollar prices ex-works, the cost of packaging of a representative consignment and c.i.f. dollar prices at the appropriate North American ports. It proved to be fairly easy to obtain a preliminary opinion about the rate of duty which would be charged on the product. The commercial officer was able to determine from these figures how much it would probably cost, duty paid. He knew that the trade customarily added a small percentage to produce an estimate of the delivered cost. His knowledge of the pricing structure enabled him to estimate prices along the chain of distribution to the final seller. Comparison of these estimates with the prices of competing goods already on offer locally equipped him with knowledge which would prove invaluable when the time came to assess what he had been told in the trade.

The prospective agent, having looked at the illustrations of the product and the estimates of price, and thinking of the level of demand in the territory covered by his sales organization, of how to add a new line to his range, of the cost of selling it and of the possible return, would then be likely to ask questions of this kind: "I would need a commission of so much; would the manufacturer be agreeable?" "Selling this product would call for much promotional advertising; to what extent would the manufacturer contribute?" "How many units can the manufacturer deliver during the peak season—what is his maximum rate of delivery—what will be the delay between the dispatch of my order and the delivery of the product?" "Has the manufacturer any other agents in this country?" "What can you tell me about the firm—what is the size of their plant—what equipment have they—what can you tell me about them which will convince me that I shall be negotiating with the sort of firm I should do business with?" Brief answers to all these questions would be contained in the forms. The care with which they were written would be reflected in the presentation of the proposal.

From the post's classified records of local firms known

to be interested in handling imported merchandise, the commercial officer prepared a list of those thought to be best suited to the manufacturer's needs. The proposal was then discussed by telephone with each firm on the list. Some were not able to take on a new client, some handled directly competing lines and the interest in imported merchandise which others had expressed in the past had long since waned. One or two of the commercial officers were able to stop this preliminary approach fairly quickly, since many of the best firms had expressed interest in seeing the brochures, as copies were available. Other commercial officers were not so fortunate, only one or two of the entire list of firms, good and indifferent, wanting to take the matter further. In these cases the commercial officers would extend these lists from local classified telephone directories and the specialist trade directories. They would ask the advice of friends in associated trades, in the local Chamber of Commerce, in the banks and Government Departments. They would speak to the publishers of the trade Press and secretaries of the trade associations, from whom they were sure to have valuable advice.

The telephone conversations would have indicated the form of the next approach to the interested firms. Some wanted time to consider the proposal and were already well known to the commercial officer; to these he sent a descriptive letter. Others were not strongly interested and the commercial officer wanted an opportunity to meet the agent and see his place of business; he called on these and discussed the proposal in full. When all the firms had expressed their views the commercial officer would be ready to dictate his report.

This would begin with a short statement of the market potential for the product in his particular area. In some posts, time permitted an extensive report; in others, only the bare bones could be put on paper, but the reports written in all posts represented the views of traders. The commercial officers themselves claimed no special knowledge. They were trained observers who knew how to garner information and how to separate the wheat from the chaff, but what they had to report was no more than the sum of what they had been told.

Information about Potential Agents

Some of the firms to which an approach had been made were so interested in the proposal that they wrote direct to the manufacturers, offering their services. Others were no less interested, but preferred to be invited to accept the agency by the manufacturer. The second part of the commercial officers' reports concerned the individual firms, the degree of their interest and their particular comments which were not covered by the opening general statement. Each firm's name was accompanied by a short description of methods of operation; an indication of the territory covered and size of the sales force; and an assessment of suitability.

The eleven commercial officers sought to report the names of three or four interested firms in their districts to enable the manufacturer to negotiate first with the firm which appeared to him to be most suitable. The descriptions of the firm and the assessments of suitability were provided as a guide. These were based on what the firms had to say about themselves, on personal observation and on the comments of banks and other organizations which could contribute useful information. They contained no financial information, or very little, and the normal precaution of obtaining bank and mercantile reports continued to be necessary.

All this work had taken a considerable time to complete. Some reports reached the manufacturer within a month, others took more than two months. Although work had started simultaneously in the eleven posts, the trade correspondents of some of the commercial officers had delayed their replies. Some agents wanted time to discuss the product with their customers; others were out-of-town on selling trips; or the executive responsible for the appropriate department was sick or on vacation, but finally the manufacturer could compare the results of eleven independent surveys.

Much of what was said was common to all reports; but much was divergent. This was inevitable, because the investigations had been carried out in eleven posts each distant from the next in a continent which gives ample room for variations in taste and usage, in level of demand and concentration of competition. But the divergencies were themselves valuable. Combined with what the manufacturer had learned elsewhere, they guided him towards his decision where to start first.

The Manufacturer's Preference

The quality of the firms which had expressed interest in his product contributed largely towards the decision. The manufacturer had expressed a preference to sell through an agent who, for a commission, would take orders from customers for execution by the factory, the goods being consigned direct to the customer. It was noteworthy that posts in Canada and on the Eastern and Western seaboards of the United States had suggested the names only of commission agents or of both commission agents and wholesalers or distributors. Although commercial officers elsewhere had observed the manufacturer's preference for a commission agent they had been obliged to spread their search among firms operating in many different ways. The reason was that commission agents could only work on behalf of firms abroad if their customers were accustomed to direct importation, the planning for the delayed delivery inherent in the import trade, and all the intricacies of import documentation and clearance through Customs.

Canada imported from the United Kingdom about as much as the United States, but had a population only a tenth as big: the concentration of imports had been such as to develop the techniques of importing widely in the trade and to permit commission agents to play their valuable part. The comparatively small interest in imports of the product in the United States, on the other hand, was concentrated around the major ports; elsewhere it was so diffuse that few firms had made so much as a single import transaction. In these circumstances commission agents could not often serve manufacturers overseas without extending their functions unless they changed their methods of operation to such a degree that they could no longer be called commission agents.

In some places jobbers or wholesalers were found to be interested; in others, agents who were willing to take delivery of consignments on behalf of customers, deal with the import documentation and clearance through Customs, and accepted responsibility for payment. Some posts found interest among distributors who bought and sold on their own account but had the exclusive representation of a very few manufacturers. And among the many interested firms there were manufacturers of allied but non-competing lines who thought of selling the imported product to round out the range of goods offered by their salesmen and so economize in the costs of selling.

The eleven reports helped the manufacturer in three main ways: they demonstrated that the prospects of doing business justified the expense of time and money on detailed study of the market; they indicated in what areas it was best to start and so reduced the possibility

of wasted effort; they provided the names of carefully selected local firms known to be interested at least in opening negotiations.

The manufacturer postponed negotiations with some of the firms from whom he had received offers of representation, but opened or continued correspondence with others in the areas where the prospects appeared best. The course of the negotiations suggested that a visit to North America was justified by the prospects of future trade and that the importance of beginning with the best possible agent was such as to necessitate selection by personal assessment. He had not visited North America before and a reading of the pamphlets in the "Hints to Business Men" Series which he obtained from the Board of Trade before leaving, prepared the way. On arrival, a call on the commercial officer confirmed and elaborated much of what the manufacturer had learned. Above all, the reports he had received made it possible for him to get down to effective work immediately without having to waste time and money in a strange city on searching among scores of firms for someone who was interested enough to study his proposals.

All manufacturers cannot be helped in opening a new market by the techniques illustrated in this story. Sometimes the product suggests sale by repeated offer by mail to importers, wholesalers or brokers: the commercial officers can help by providing, through the Board of Trade, selectively compiled lists of names and addresses of firms which may be interested in the offers. Many such lists prepared in the past and frequently revised are readily available in London. Some goods may best be sold by offer to the buying offices in London of the great department stores: the Board of Trade maintains lists of the buying offices. The product and the market may indicate periodical selling tours of the manufacturer's representatives from the United Kingdom: the commercial officers will suggest the names of additional firms to be called on.

The manufacturer may not have reached the point at which he wants to begin to sell, but wishes to study the market to see what opportunities may be open to him. The "Market Digests"* written about his particular trade by commercial officers will indicate whether further and more detailed study is justified and, in brief terms, how the business is done. It will give him the basic statistical and Customs information; the addresses of the trade associations and of the publishers of the trade periodicals; the dates of the trade fairs; and the sources of more detailed information.

In providing information about the market, the commercial officer seeks to guide the manufacturer who proposes to sell in a new market towards the method of trading suggested by the product, the amount he has to sell, and the trading conditions and customs of the country concerned. In providing names of local traders, he seeks to guide the manufacturer towards the best firms in the new market interested in the manufacturer's proposals. The performance of these tasks calls for a broad knowledge of the techniques of merchandising and for practice of the art of the reporter, not for technical knowledge of the product.

Serving all industries the commercial officer seeks to be expert in what is common to all—merchandising. But he works with the briefest of information about the product and the capacity of the factory; he knows nothing of the manufacturer's plans for the future. If he helps in the way this story has illustrated, so much the better; if he fails to discover interest in the product there is always room for hope that the manufacturer, with his intimate knowledge of it, will be able to arouse interest where he has failed. The commercial officer can save the manufacturer's time, but his work cannot take the place of a visit to the country by the manufacturer himself.

* Issued by the Board of Trade in the Special Register Information Services.

Modern Aircraft Carriers

Of the two light fleet carriers of the Hermes class which will be coming into operational service with the Royal Navy during this year H.M.S. *Centaur* (Captain H. P. Sears, R.N.) has already been completed at the Belfast Yard of Harland & Wolff, Ltd., and has since been modified to incorporate angled deck arrangements at the Royal Dockyard, Portsmouth. This work is now complete and the ship started her trials this week. The other ship, H.M.S. *Albion*, is now nearing completion at the Wallsend-on-Tyne Yard of Swan Hunter and Wigham Richardson, Ltd.

It is estimated that some 250 miles of cables are installed in both the *Centaur* and the *Albion*, and that the shipbuilders were required to make about a quarter of a million electrical connections to complete each installation. The generating plant in each ship consists of eight 400 kW generators. Four of these generators are steam driven and four diesel driven and each is capable of sustaining a 10 per cent overload for two hours.

A 220 V d.c. watertight ring main system is used for distribution and supplies are tapped off at convenient points round the ship through about 200 electrically operated circuit breakers. An emergency supply system is fitted for use in the event of damage. Distribution is controlled from a central large switchboard and four smaller switchboards are provided for use in emergency from each of which the supplies to a quarter of the ship can be controlled. All switchboards are provided with an elaborate system of indication lights.

There are more than 700 electric motors in each ship. These range in size from 100 h.p. machines for aircraft lifts down to f.h.p. motors for a variety of services such as potato peeling, drinking water cooling, photo printing, paint mixing, collar ironing and ice cream making.

A 300 line automatic telephone exchange is fitted, operated from a 50 V d.c. supply, rectified from a 230 V, 50 c/s a.c. source. For vital action communications, sound powered telephone groups, independent of electricity supplies, serve the various ship departments.

An integrated main broadcast system is fitted. General information, warning signals, etc., are passed over this system to all parts of the ship. In action, the various departments of the ship can take control of appropriate units of the system, e.g. the armament broadcast unit by gunnery personnel, the flight deck and hangar broadcast unit by flying personnel, etc., and under these conditions only warning signals from the main system can over-ride transmissions on the unit system. About 400 loudspeakers are installed.

There are some 8,000 lighting points, 2,500 of which are fitted with twin lamp fluorescent fittings. Both ships are equipped with a comprehensive system of flight deck lighting to provide for night landing by aircraft.

For escape purposes, in the event of severe damage to the ship with the normal lighting out of action, a complete system of battery operated emergency lanterns is fitted. These relay-operated miners' type lanterns switch on automatically immediately the normal lighting fails. "Red" lighting is fitted to allow for rapid adaptation of vision at night.

MATERIALS HANDLING

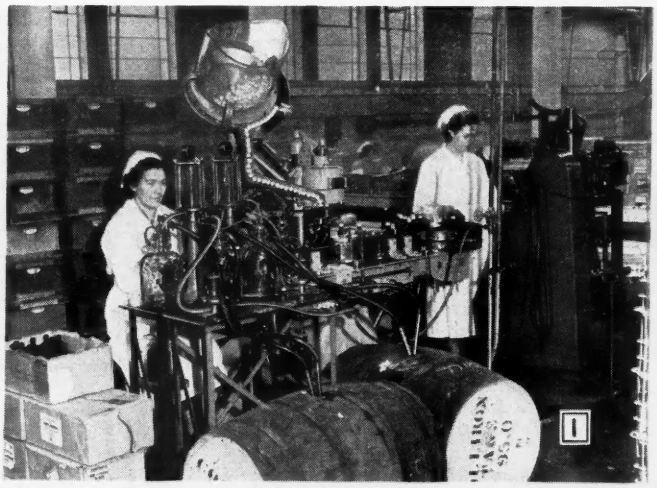
A Comprehensive Installation for Handling Medical Supplies

IT is unlikely that there is a better example of the various mechanical aids available for handling comparatively small quantities of both liquids and solids, as well as their containers, than that provided by Evans Medical Supplies, Ltd., at their Speke factory. The installation covers the whole range of processes from the washing and sterilizing of the bottles, jars, etc., through the various operations involved in the manufacture and packing of the medical preparations, to the assembly and dispatch of the completed orders which may comprise a large number of different items. The comprehensive conveyor system with its selective devices is of special interest.

Bottles, jars, etc., returned to the factory after use are first sorted and then washed, rinsed, sterilized and dried at a rate of 22,000 a day by means of one Powley jar washer and one Dawson machine: bottles have to pass through both machines. Overhead conveyors take them either to stores or direct to the manufacturing sections for refilling. Carboys are dealt with on a rotary machine holding twelve at a time and giving automatically successive pre-rinses, two washes with detergent, final rinses, draining and hot air drying.

Dry powders are weighed on rows of filling tables some of which are equipped with conveyors. A vibrating feeder with quick cut-off supplies some powders to the bulk containers. Other powders and crystals are filled on automatic weighing machines controlled electrically. Liquid preparations are filled by vacuum operated machines of various types. The caps are spun on to the bottles, the threads being formed during the process, and the labels are automatically attached. " Cellophane " wrappings are sealed electrically. No special electrical equipment is involved in the filling of most ointments and liquids though liquid paraffin is brought by means of remote controlled pumps into containers from tanks outside the building, an air separator being provided.

In the sterile filling unit the bottles, ampoules, etc., are washed and sterilized in heated autoclaves. G.E.C. ovens are available for sterilizing the larger utensils, etc., with a Bendix washing machine to deal with the rubber tubing.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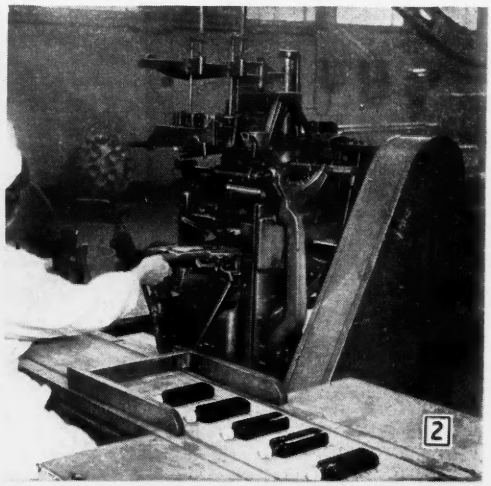
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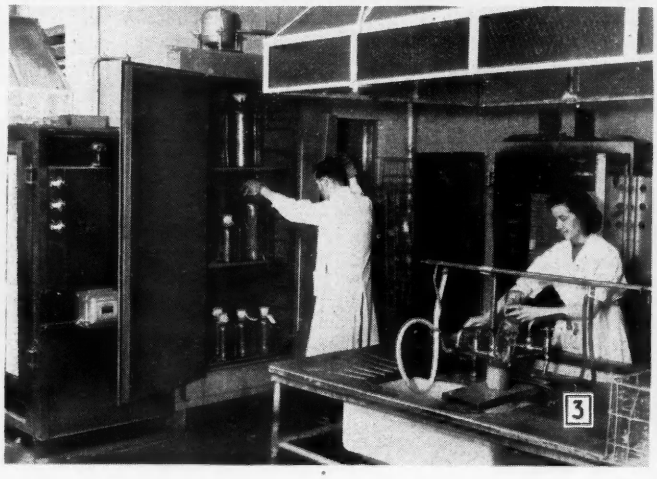
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Various fixed and portable pumps have been provided for the transfer of liquids from one container to another, and for compressed air and high vacuum service mains. Automatic electrically operated combined filling and sealing machines are employed, a high vacuum pump being provided for exhausting tubes containing drugs liable to decompose rapidly. After sealing, the ampoules are inspected under high intensity fluorescent lighting to ensure that they do not contain any pieces of glass and are passed on by bench conveyor to the labelling and packing tables and thence to the stock rooms.

The whole of the sterile filling department is air conditioned and in addition there are dust and fume extraction units for sections handling arsenical compounds and preparations emitting strong or obnoxious odours.

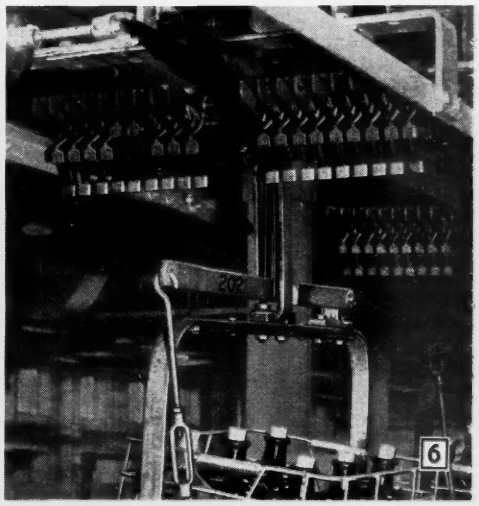
Altogether the workshops deal with about 20,000 items, which are kept in six main stock rooms, one containing the larger items, generally bought in bulk, and in the others the smaller articles not so extensively required. In addition there are refrigerators for storing vaccines and other items that have to be kept at low temperatures. Serving each of these stores are double deck belt conveyors. Trays containing the orders enter the stores on the top belt and are returned on the lower belt with the various goods to the starting point for unloading and recirculating.

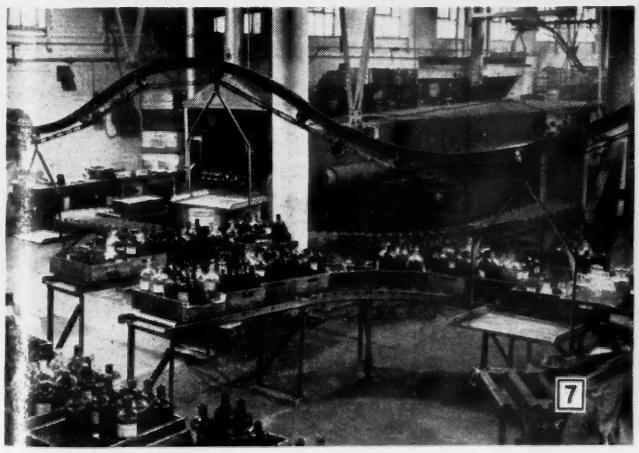
Here they are transferred to the factory's main conveyor system which travels throughout the building collecting or delivering containers, drugs, etc., a trigger system on this conveyor diverting the trays travelling on it to any one of thirty-four desired points. Arriving finally at the dispatch department the completed orders are discharged on to one of fourteen band and roller conveyors where the goods are packed ready for loading on vehicles in the dispatch bays.

The conveyor system, which was installed by Sovex, Ltd., includes altogether two large and one small overhead units, three floor conveyors which are employed for crates and other articles too heavy to deal with on the overhead system, five long belt conveyors, three sections of overhead belt and thirty-four small belt conveyors, as well as thirty-two bench units. They involve the use of eighty-two motors, chiefly of Crompton Parkinson make, ranging in size from $\frac{1}{4}$ h.p. to 3 h.p. They are controlled by Allen West push-button starters. Handling of large articles is also facilitated by the availability of a Ransome electric stillage truck and a Ransome fork lift truck.

The electricity supply for the factory is provided by the Merseyside & North Wales Electricity Board. The electrical installation was carried out by Campbell and Isherwood, Ltd.

(1) View in the bottle filling department. (2) Labelling machine. (3) Electric oven in the sterile filling department. (4) Floor conveyors. (5) Double deck conveyors in the stores. (6) Section of main conveyor showing trigger device. (7) Part of the bottle washing section showing the arrangement of conveyors at the feed end of a washing machine. (8) Empty boxes being transferred to the rear end of one of the washing machines by means of a conveyor





NEW BOOKS

Television Receiver Servicing: Vol. I: Time-base Circuits. By E. A. W. Spreadbury, M.Brit.I.R.E. Pp. 310; figs. 187; index. Published by Trader Publishing Co., Ltd., and distributed by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 21s.

This book is mainly intended for the professional radio service engineer who, having already become skilled in the art of fault tracing in radio receivers, wishes to extend his activities to television servicing. Others interested in television will, however, also find it a fund of information not available in other current books on the subject. It does not attempt to teach the principles of radio servicing, but extends them to the more complex circuits and techniques of television.

The author describes, in a practical and straightforward manner, each section of the receiver, and shows the reader how to check that the waveform is correct at the input and output of each section. Comprehensive information is given on fault location and how to isolate a faulty section from the rest of the receiver. The work is fully illustrated and includes diagrams of a wide variety of actual circuits, each of which is discussed in detail in the text.

The present volume covers the time-bases and their associated circuits only; and probably at least half the servicing problems likely to be met by the engineer occur in these sections. The remaining sections of the receiver are to be dealt with in a second volume now in course of preparation.

Electrical Earthing and Accident Prevention. Edited by M. G. Say, Ph.D., M.Sc., M.I.E.E. Pp. 248; illus. 123 and index. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 25s.

Ways and means of avoiding risks of shock or fire from electrical causes through the earthing of metal that is not intended to be at an appreciable potential are collected in compact and convenient form in this book. The scope of the subject is indicated by division into nineteen sections which are dealt with by separate authors with specialized experience. Its matter ranges from particulars of the broad background of accident prevention, with a summary of earthing regulations and codes of practice and their application to high, medium and low voltage power systems, on the one hand to what is necessary to protect users of installations on the other.

The first group is usually within the province of skilled executive engineers who will nevertheless find the book a handy guide to and reminder of their obligations. The more immediately practical appeal will doubtless be to those responsible for factory and domestic installations, especially portable appliances and their connections, which carry most risks. Some good protective circuits are described for such cases. Reference might have been made to the requirements of temporary installations, including those for building work out-of-doors, with appropriate indexing.

Other sections include the special earthing requirements for ships, traction, mining, aircraft, telecommunications systems and for arc welding, electronic, electromedical and stage lighting equipment and radio-frequency instruments. Protection against lightning is dealt with in a way that should make the needs of any case clear to non-specialists. A chapter on earthing measurements and maintenance contains several nomograms relating to buried electrodes and an appendix indicates the wide ranges of soil resistivity that may be encountered. The book should prove a welcome addition to the library of practical engineers.—C.O.B.

Introduction to Ultra-High-Frequency Radio Engineering. By S. A. Knight. Pp. 256; figs. and index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 21s.

This is said to be ". . . written primarily for those engineers, students and members of the technical branches of the Services who wish to obtain a working background of the subject without complicated mathematical theory or unnecessary detail." This is a very adequate summary of the book which covers the following major topics: u.h.f. circuit elements (lines, waveguides and resonators), u.h.f. valves and measurements, propagation and aerials. There is also a chapter on c.r. tubes and sweep circuits.

The book strikes a very happy balance between those which give a purely qualitative account of microwave phenomena and the specialist works with full mathematical treatment and should prove valuable. The treatment is even throughout, no subject being stressed at the expense of others. The following passages should, however, be drastically revised: the second paragraph on p. 6 is completely outdated; the last paragraph of p. 108 gives a false impression; the relevance of fig. 91 is far from clear; the section on positive grid oscillators should be left out as, contrary to the author's statement, B.K. oscillators are complicated affairs hard for beginners to understand; and the sections on centimetre aerials should be enlarged.

My only major criticism is that the book contains neither a bibliography nor a single reference. Surely a useful introduction of this type should make the reader interested in more detailed treatment of the subject matter? I think the author should have an opportunity of doing this in a second edition.—A.H.B.

Television Receiver Design. Flywheel Synchronisation of Sawtooth Generators. By P. A. Neeteson. Pp. 483; figs. and index. Philips Technical Library. Cleaver-Hume Press, Ltd., 42a, South Audley Street, London, W.1. Price 21s.

Considerable progress has been made in regard to synchronizing and timebase circuits in television receivers in recent years. Perhaps the two most outstanding developments have been automatic frequency control and the energy recovery circuit for horizontal scanning which have both led to the present high standard of performance using large wide angle picture tubes.

Mr. Neeteson deals first with sawtooth generators both in principle and practice in some detail. This introduction is really essential to the development of the later sections on synchronization, flywheel circuits and automatic phase control which, in particular, contain a considerable amount of material concerning the multivibrator and blocking oscillator.

From the theoretical viewpoint this book is to be highly commended and it is doubtful whether such a wealth of material on the subjects in question has previously been available. On the other hand there are a number of circuits in use which unfortunately are not discussed, although various references are made. The reader may feel that the section on applications is rather brief. Nevertheless, everyone interested in television techniques will find this a most absorbing volume and without doubt it represents a considerable contribution to the literature.—D.H.F.

VIEWS on the NEWS

By REFLECTOR

MOST of the London newspapers and a number of "provincials" gave attention to the new 3·2 MV surge generator at the National Physical Laboratory, and it was interesting to observe the different ways in which the subject was handled. The *Evening Standard* merely said that "artificial thunder and lightning were produced at a new generator at Teddington." The *Daily Telegraph* referred to it as a new "engine" and went on to say:—

> "One of the machine's objects is the simulation of lightning effects within the laboratory." *Another* [my italics] is the testing of high voltage equipment, generators, transformers, insulators and cables needed for Britain's rapidly expanding grid system."

Under the heading "Lightning? Just Press 9 Buttons," the *Daily Worker* said that, pressing nine buttons, the director of the N.P.L., Sir Edward Bullard, "produced a series of 3,200,000 volt flashes—each lasting a 50-millionth of a second and releasing sufficient energy to light up a town for as long."

* * *

Complaints were made at a recent meeting of the Pitlochry Sub-Section of the Electrical Power Engineers' Association of shortcomings of houses provided for its staff by the North of Scotland Hydro-Electric Board. In some of these, it was said, there were neither cooking facilities nor coal fireplaces and the tenants had no option but to purchase electric cookers and heating appliances. It was resolved to ask the Board either to install a fireplace in each of these houses, with normal water-heating facilities, or to make some concession on the price of electricity charged to the tenants. I suppose that there is a genuine grievance here but it seems to be a trifle queer to find electrical men asking for what is in effect a subsidy for living in all-electric houses.

* * *

At this same meeting another strange matter was aired. According to a report in the *Electrical Power Engineer*:—

> "Interest was again focused locally when the subject of seals fitted recently to staff electricity meters was raised. Most of the staff in the South Caledonia Area of the Hydro Board had had special seals fitted to their meters; this seemed to imply a lack of confidence in the honesty of the staff by the Board and some members felt that the Board should be asked to account for their action. It was finally agreed that before taking action information should be obtained about practice in the other areas of the Board."

That such practice should make the men of South Caledonia stern and wild is not to be wondered at.

* * *

From time to time I have reflected upon the subject of initials, of which there are far too many. Usually I have called attention to the possibilities of confusion arising from the sharing of the same set of initials by two or more bodies, e.g., B.E.A. I expect the Association of Supervising Electrical Engineers thought that it enjoyed the exclusive use of its initials, but I have just received from the United States a communication headed "A.S.E.E.", which proves to have emanated from the American Society for Engineering Education. For the record I may say that the document related to the celebration of the 50th anniversary of the "engineering experiment stations" of the Iowa State College and the University of Illinois. These are devoted to research in various engineering fields. The Illinois establishment spends over $3½ million on its projects annually.

* * *

Everybody knows, I think, that an American billion differs considerably from ours and that an American gallon is rather smaller than the imperial one. Apparently their jubilee ratings are different too. Here we hold that a diamond jubilee is a sixtieth anniversary but the United States is this year celebrating the seventy-fifth anniversary of Edison's first incandescent lamp as "The Diamond Jubilee of Light."

Edison's carbon-filament lamp followed a series of experiments in which he had evolved a lamp with a platinum filament. The *Electrical Review* of 15th January, 1880, reported that:

> "Having perfected the platinum lamp, apparently, Mr. Edison was led to try, 'by accident,' a filament of compressed lampblack and tar, heated by the passage of the electric current, and the result was satisfactory. A piece of carbonized cotton was next tried, with better results still: a light equal to several gas jets being obtained. Several other experiments with various carbonized substances were then tried, and finally the carbonized strip of cardboard was found to give the best results."

* * *

The application of electric heating to a cold store may be reckoned as unusual. The *Birmingham Gazette* says that the clay subsoil beneath the floor of the Coventry public abattoir's cold store is sometimes frozen into a solid block by the store's cooling apparatus. When that happens the clay swells and pushes the entire floor 7in above its normal level. Now electric heaters are being sunk into the clay to be switched on whenever the subsoil temperature approaches freezing point "to keep the clay warm and the floor where it should be." I should have thought that some form of heat pump would have been possible for solving this problem.

* * *

At the annual parish meeting at Overton (Hants) it was reported (according to the *Hants and Berks Gazette*) that:—

> "They had received a further £60 from the County Pie Scheme and had purchased eight gas heaters for St. Luke's Hall at a cost of £99, the Council providing the other £39."

It is to be hoped that this County Pie Scheme is not purely a gas affair and that the electrical industry may have a finger in it.

* * *

Co-operation between the electrical and cinema industry as reported by the *Daily Film Renter*:—

> "Leeds: Electricity showroom display by R. G. Porter, Majestic, linked sub-normal temperatures and value of electricity for heat with 'Hell Below Zero.'"

PERSONAL AND SOCIAL

News of Men and Women of the Industry

UPON the occasion of the inauguration of the Owen Falls hydro-electric undertaking, Uganda, by Her Majesty the Queen yesterday (Thursday) a knighthood was bestowed upon **Mr. Charles Redvers Westlake,** M.I.E.E., chairman of the Uganda Electricity Board. Before Mr. Westlake went to Uganda he was general manager and electrical engineer of the Finchley Corporation undertaking. He had previously been the first county electrical engineer of Dumfriesshire and first chief engineer and manager of the Electricity Board for Northern Ireland. During the last war he undertook special military duties and held the rank of lieutenant-colonel.

Mr. Westlake was appointed in 1946 to lead a mission to investigate electrical power development in East Africa and spent some months there, later becoming electrical adviser to the Uganda Government. When the Uganda Electricity Board was set up in 1948 Mr. Westlake became its chairman, and later he joined, in addition, the Uganda Cement Industry organization as deputy chairman and executive member.

Mr. John Miles Stock, M.Eng., M.I.Mech.E., M.I.E.E., the Board's chief electrical engineer, has been made an O.B.E. Mr. Stock, after leaving Liverpool University, served an apprenticeship with the British Thomson-Houston Co., Ltd. Then, after a short period with the Liverpool Electric Cable Co., he went to Argentina, where he served with railway and electricity supply authorities. In 1934 he returned to England to join the Yorkshire Electric Power Co. as a district engineer. Mr. Stock was appointed chief electrical and mechanical engineer of the Palestine Public Works Department in 1938 and in 1946 was transferred to Nigeria as senior electrical engineer and later deputy engineer-in-chief of the Government electricity undertakings. He retired from the Colonial Service in 1949 and was appointed deputy chief electrical engineer to the Uganda Electricity Board; he succeeded Mr. A. O. Cosgrove as chief electrical engineer in 1950.

Mr. C. R. Westlake

Mr. J. M. Stock

Mr. H. W. Povey, chief accountant to the Board, also becomes an O.B.E.; **Mr. H. Olivier,** Ph.D., M.I.C.E., is appointed a C.M.G. for his services to the Board; and **Mr. E. H. Wilson,** secretary to the Board, is made an M.B.E.

Sir George Bailey, C.B.E., M.Sc., M.I.Mech.E., M.I.E.E., M.I.P.E., whose election as president of the British Electrical and Allied Manufacturers' Association is reported in this issue, was educated at Loughborough Grammar School and graduated at University College, Nottingham. On completing his apprenticeship with the Brush Company at Loughborough in 1907 he joined the British Westinghouse Co., which later became Metropolitan-Vickers.

Sir George Bailey

In his early days at Trafford Park, Sir George was mainly engaged in the development of steam turbines and gas engines, eventually becoming chief draughtsman in the department. On moving to the production side, he became works manager in 1919 and later works director. He was appointed to the board of Metropolitan-Vickers in 1927 and became chairman in 1944.

Concurrently with these activities, he had assumed responsibility for co-ordinating the production of the companies within Associated Electrical Industries, Ltd., on the formation of this group in 1929. He became managing director of A.E.I. in 1945, deputy chairman in 1946 and chairman in 1951.

The Minister of Fuel and Power has re-appointed **Lt.-Col. Sir Merrik R. Burrell,** Bt., C.B.E., J.P., of West Grinstead, Sussex, as a part-time member of the South Eastern Electricity Board. **Mr. G. Humphreys,** of Orpington, has retired from the Board on completion of his term of office.

Mr. R. McGlashen, A.M.I.E.E., has been appointed an assistant chief commercial officer at Area headquarters of the South West Scotland Electricity Board. Mr. McGlashen has been district commercial officer in the Central District of the Glasgow Sub-Area since June, 1953. Previously he was with the Merseyside and North Wales Electricity Board.

Mr. P. T. Fletcher, B.Sc., M.I.Mech.E., A.M.I.C.E., M.I.E.E., chief mechanical and electrical engineer in the Ministry of Works, has been appointed (as from 1st June) deputy director (engineering services) in the Department of Atomic Energy. Mr. Fletcher has been with the Ministry of Works since 1939 and has held his present position since 1950.

Mr. K. R. Taylor, A.C.A., who has been secretary since 1946, has been appointed a director of Santon, Ltd.

Thorn Electrical Industries, Ltd., announces the appointment of **Mr. Eric Hutchison** to the Atlas Lighting Division as special representative for the Scottish area. Mr. Hutchison was previously with the Illuminating Engineering Department of the General Electric Co., Ltd.

Mr. N. C. Stamford, M.Sc., M.I.E.E., has recently been appointed to the secretary's staff as education officer of the Institution of Electrical Engineers. Mr. Stamford received his general and electrical engineering education successively at Highgate School and at the City and Guilds Engineering College. After a period with Marconi's Wireless Telegraph Co., Ltd., he was appointed lecturer in electrical engineering in the University of Manchester, occupying this position from 1933 to 1944. In that year he was appointed principal, Marconi College, with additional responsibility for education and training in Marconi's Wireless Telegraph Co., Ltd. He subsequently became deputy education and training officer to the British Electricity Authority, resigning from that post on the acceptance of his present appointment.

Mr. N. C. Stamford

The **Caroline Haslett Trust** recently awarded four more scholarships to enable girls to take a domestic science training at a recognized college prior to engaging in careers in the electrical industry. The girls are:—Miss Angela Murr, Epsom (scholarship tenable at the National Training College of Domestic Subjects, London), Miss Judith Turnbull, Tynemouth (scholarship tenable at the Edinburgh College

of Domestic Science), Miss Vivien Pedley, Burley-in-Wharfedale, nr. Leeds (scholarship tenable at the Yorkshire Training College of Housecraft, Leeds), and Miss Veronica Hurst, Smethwick. Applications for the award of a Travelling Exhibition must be returned by 24th May.

Mr. P. Rose, Scottish representative for Ward & Goldstone, Ltd., will shortly take up his new appointment with the company as northern sales manager, based in Manchester. He will be succeeded as Scottish representative by **Mr. J. McCulloch.**

Following the resignation of **Mr. A. G. Peacock,** B.Sc., A.R.I.C., A.Inst.P., for seven years the secretary of the Scientific Instrument Manufacturers' Association, **Mr. E. D. Hart,** M.A., A.Inst.P., A.M.I.E.E., has been appointed deputy director, and **Miss G. E. Moss,** B.A., formerly clerk to the Council, has now taken up the position of secretary. Mr. Hart, who was for many years with Marconi Instruments, Ltd., and lately with the Equipment Division of Mullard, Ltd., takes up his new post on 1st June.

Mr. I. H. Hedley, B.Sc., M.I.E.E., has joined the staff of the Hackbridge & Hewittic Electric Co., Ltd., as technical adviser and sales representative in Northern England and the Midlands. His services will be in addition to the company's present representation in these areas.

The appointment is announced by Johnson & Phillips, Ltd., of **Mr. Alan Grant** as manager of the company's Sales Department (Cable Estimating). Mr. Grant joined J. & P. in 1919, and has for many years been assistant manager of that department.

Mr. A. Grant

The London Division of the **British Electricity Authority** is holding its Parents' Day and prizegiving on 7th May. In the afternoon the parents will be received at the Apprentices' Training School, adjoining the Bankside generating station, and after a tour of inspection will proceed to the Institution of Electrical Engineers where Lord Citrine will present the prizes and indentures to the apprentices.

Mr. E. A. Moore, head of the Industrial Pyrometry and Power Plant Sales Department, who has retired after fifty-one years' service with the Cambridge Instrument Co., Ltd., was entertained recently to dinner by the directors at the Rembrandt Hotel, London. In addition to Mr. and Mrs. Moore and the directors, the dinner was attended by the heads of the London office departments and by employees at the head office having over twenty-five years in the company's service. On behalf of all his colleagues at the London office, the district representatives and the works, Mr. F. Wakeham, joint managing director, presented Mr. Moore with a silver rose bowl and also a gold-mounted pocket wallet from a few of his friends overseas.

Mr. G. Davidson, M.I.E.E., is leaving the Association of Supervising Electrical Engineers at the end of this month to take up an engineering appointment. Mr. Davidson, who was technical officer and assistant general secretary, joined the staff of the Association in 1948.

Mr. R. L. Higgin, A.M.I.E.E., has been appointed sales manager to "Diamond H" Switches, Ltd., in succession to **Mr. F. A. Honess,** who is now production manager. Mr. Higgin was apprenticed with the Walsall Electrical Co., Ltd., and later joined the British Electrical and Allied Industries Research Association. He served during the war in the R.N.V.R. as electrical lieutenant and was northern counties sales representative to "Diamond H" Switches, Ltd., before his new appointment.

Mr. R. L. Higgin

The Spring Meeting of the **I.E.E. Scottish Centre** will be held from 21st to 24th May at the Atholl Palace Hotel, Pitlochry. In addition to social activities, a visit will be made to the Errochty power station of the North of Scotland Hydro-Electric Board. Members wishing to take part in the Spring Meeting are asked to notify Mr. J. H. P. de Villiers, c/o Bruce Peebles & Co., Ltd., 19, Waterloo Street, Glasgow, C.2, by 15th May.

OBITUARY

Mr. E. G. Clark.—The death occurred on 23rd April of Mr. Edmund Graham Clark, M.C., M.Sc., M.I.C.E., secretary of the Institution of Civil Engineers. Mr. Clark, who was sixty-four, was to have retired from the secretaryship of the Institution in August next. He graduated in the Faculty of Engineering of the University of Durham, and served as a pupil and later as an engineering assistant to Mr. J. Mitchell Moncrieff on works on the River Tyne. His association with the Institution of Civil Engineers commenced after the 1914-18 war when he was appointed chief technical assistant. He became chief assistant in 1933 and acting secretary early in 1937, being confirmed in the post of secretary at the end of that year.

Mr. R. O. Ackerley.—The death occurred on 22nd April, at the age of fifty-nine, of Mr. Richard Oliver Ackerley, M.I.E.E., F.I.E.S., the well-known lighting consultant. Mr. Ackerley was educated at Eton and won a scholarship to Oxford. During the 1914-18 war he served with the South Wales Borderers and was awarded the M.C. He joined the General Electric Co., Ltd., in 1919 and from 1924 to 1929 was assistant manager of the British General Electric Co., Ltd., Durban. In 1929 he returned to this country and two years later took charge of the G.E.C. Illuminating Engineering Department, a position which he held until 1949, when he retired from the company and set up in practice as a lighting consultant. He was a past-president of the Illuminating Engineering Society and represented that Society on the National Codes of Practice Committee. He was chairman of the Installations Section of the Institution of Electrical Engineers for 1948-49.

The late Mr. R. O. Ackerley

Mr. Ackerley had made a substantial contribution to the literature of illuminating engineering and in 1945 was awarded the I.E.E. Crompton Premium for a paper on "Some Factors Affecting the Design of Electric Lighting Installations for Building Interiors." He was also the author of a book entitled "The Science of Artificial Lighting."

Mr. David Garfield Rodger, assistant general manager (commercial), Johnson & Phillips, Ltd., died suddenly on 16th April, at the age of sixty-eight. Mr. Rodger had been associated with J. & P. for forty-eight years, joining the company in 1906, in the days of the Arc Lamp Department, of which he became manager. He subsequently held several senior administrative appointments. For many years he was export sales manager, and in this capacity he was responsible for the development of the J. & P. organization overseas. In 1946 Mr. Rodger became assistant general manager (commercial). He was prominent in C.M.A. circles.

The late Mr. D. G. Rodger

Mr. F. C. Robinson, for many years in charge of industrial sales of Santon,

Ltd., died on 18th April, at the age of fifty-four. Mr. Robinson joined the company in 1939 and was for some time manager of the Birmingham Branch.

Mr. J. H. St. Hill Mawdsley.—The death occurred on 24th April at Bridport, Dorset, at the age of eighty-three, of Mr. John Herbert St. Hill Mawdsley, late of Mawdsley's, Ltd.

TV Transmitters for Denmark

SIX television transmitters (three vision and three sound), with associated aerial systems, transmission lines and combining units, are to be manufactured by Marconi's Wireless Telegraph Co., Ltd., for installation in Denmark. This order has been received from Sophus Berendsen, Ltd., the Marconi agents in Denmark, for supply to the Danish P. and T. It was secured for Britain despite severe competition from foreign countries. The first installation, at Copenhagen, is scheduled for completion early in 1955, and will consist of a 5 kW vision transmitter and a 1¼ kW sound transmitter, both of which will feed into a six-stack super turnstile aerial, *via* a combining unit and the usual transmission lines and feeders. Approximately six months after the Copenhagen station becomes operational, a similar pair of transmitters (5 kW vision and 1¼ kW sound) will also go on the air at Odense. In this case, however, a high gain three-stack super turnstile aerial will radiate the programmes. The third installation is to be made at Aarhus, where a 2½ kW vision transmitter and a 660 W sound transmitter will be sited, together with a high gain aerial.

All three vision transmitters are to be amplitude modulated, while the sound transmitters will employ frequency modulation. The equipment, in this instance, will operate to European 625-line standards.

Meter Engineers

THE sixth annual dinner of the Southern Meter Engineers' Technical Group of the Electrical Power Engineers' Association was held on 23rd April, when Mr. W. G. Slater (chairman) presided over a gathering of upwards of 160 members and friends. There were only two toasts: "Our Guests," proposed by the chairman and responded to by Mr. W. T. O'Dea—both speeches anecdotal in character; and "The Chairman," proposed by Mr. R. Thompstone, who as a user of meters expressed the goodwill of supply men for meter manufacturers as represented by Mr. Slater. Responding, the chairman paid a special tribute to the hon. secretaries of the Group, Messrs. C. W. Russell, who acted as M.C., and Davies. The brief speeches were interspersed with entertainment.

P. & O. Liner Installation

FOR the new P. & O. liner *Arcadia* equipment supplied by the General Electric Co., Ltd., comprises fluorescent and tungsten lighting installations throughout the principal passenger spaces; telephone exchange apparatus and instruments; stewards' luminous call and fire alarm systems; plural starters for motors driving auxiliary machinery; and a large proportion of the cable.

Indirect cornice lighting has been used on an extensive scale. The system is adopted as a decorative feature in conjunction with tungsten lighting in most of the spaces. In four of these—the first class lounge, library and dance space and tourist class dance space, double rows of "Osram" cold cathode tubes are installed, arranged as a combination of ivory and gold. Elsewhere the cornice lighting is by 4ft and 2ft hot cathode tubes. The fluorescent lighting is operated on a 230 V, 50 c/s supply. About 1,000 special channel fittings were supplied for the 2ft 20 W and 4ft 40 W hot cathode tubes used for cornice lighting.

Cold cathode cornice lighting in the first class library on the "Arcadia"

Tungsten lighting fittings include desk lamps and floor standards as well as ceiling fittings.

The telephone exchange equipment comprises automatic and manual units, and power supply apparatus. The stewards' luminous call system in the ship operates a 62-way master indicator, and a 21-way indicator in the tourist class.

A plural starter system has been installed for controlling twenty-three motors ranging from 155 to 8 h.p.

Electricians' Wages

WE reported last week that the Industrial Disputes Tribunal had awarded a wage increase of ½d an hour to journeymen electricians employed in the electrical contracting industry. In its award (No. 517: H.M. Stationery Office, 4d) the Tribunal relates the course of wage negotiations between the National Federated Electrical Association and the Electrical Trades Union since an increase of 2d an hour was made in November, 1952. These negotiations were interrupted by local strikes in August last when the Minister of Labour set up a court of inquiry; this court recommended the parties to resume the use of the industry's negotiating machinery. Further discussions proved abortive and there was a recurrence of the local strikes until the N.F.E.A. made an offer of 2d an hour increase. This was accepted but not regarded as sufficient by the Union, which then "reported" the dispute to the Minister of Labour who, in turn, referred the matter to the Industrial Disputes Tribunal.

In support of its claim before the Tribunal the E.T.U. contended that electricians' wages had not kept pace with the rise in the cost of living and that insufficient recognition had been made of the increased skill, ability and knowledge called for by developing techniques in the industry.

The N.F.E.A. contended that there was no justification for the claim that wages had fallen behind the cost of living and that electricians' rates were high in comparison with those of other craftsmen in industry. Moreover, their production was now no more than 65 or 70 per cent of what it was in 1939. Costs had risen in the industry through the introduction of a shorter working week, paid holidays, etc., and there was a danger of the employers being "priced out of the market" in the face of competition from the electricity supply industry and some 8,000 non-federated firms the vast majority of which did not observe the agreed wage rates and conditions and employed boys and semi-skilled labour on much of their work.

The Tribunal says that it has given careful consideration to the statements and submissions. It "takes note" of the increase of 2d an hour already granted with effect from 15th March and awards that the London and provincial rates for journeymen electricians shall be increased by a further ½d an hour from the same date.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents

D.C. Instrument Transformers

IN the abstract from *Elektrichestvo* on d.c. instrument transformers in the *Electrical Review* of 23rd April (" Engineering in Europe," pp. 745–6), it is stated that attempts at using d.c. transformers for current measurement have not been successful.

I cannot agree with this statement. We have made a large number of d.c. transformers for measuring currents of from 10 A up to 50,000 A and voltages up to 600. The current transformers have single bar primaries. The users of these devices apparently consider them successful.

I have not read the paper in question, so I am unable to comment on the double frequency technique, but in our transformers, as with the authors', the mean rectified secondary current is proportional to the direct current and is independent of wide variations of a.c. voltage, frequency and secondary impedance. One would, of course, expect such a result from a consideration of elementary transductor theory.

London, N.W.9. F. R. AXWORTHY,
Everett, Edgcumbe & Co., Ltd.

Electric Blanket Accidents

IN your issue of 16th April Mr. Grisley's defence of the reputable blanket makes welcome and reassuring reading.

Now that we also have with us the electrically heated mattress I should like to commend to manufacturers and public alike the virtues of low voltage (24 V) for this purpose. Sales reluctance over cost of the necessary double-wound transformer can be offset by stressing the safety and simplicity of construction of the l.v. blanket.

The transformer and three-heat illuminated control switch can be produced in a format artistic for any bedroom and the warmth of the l.v. blanket which is laid directly on the mattress is both delightful and safe.

Exeter. W. N. LAVIS.

Transductor Development

TWO papers relating to transductors were presented before the Measurements Section of the Institution of Electrical Engineers on 27th April. The first, by Messrs. A. G. Milnes and T. S. Law (Royal Aircraft Establishment), dealt with auto-self-excited transductors and push-pull circuit theory. In auto-self-excited transductors having rectifier valves in series with each element the main winding currents were unidirectional and produced higher sensitivity with smaller control currents than without rectification. In this country, the authors stated, the trend was for parallel or bridge auto-self-excited connections to supersede series transductors with separate self-excitation in general magnetic amplifier circuits. The former halved the copper loss and enabled more power to be drawn from a given size of transductor.

In a.c. output push-pull circuits currents circulating between the two transductors had to be limited and the supply voltage de-rated. In d.c. circuits magnetic summing into two loads improved efficiency; capacitance coupling was required across each load coil. With the series summing push-pull connection, the transductor voltage could be increased substantially. A load resistance of about half the summing resistance was recommended. With full voltage up-rating the output characteristic had the same sensitivity and output saving as for magnetic summing, but it required upwards of four times the input power. For the tee-summing connection the ratio of load resistance to tee resistance should be between two-thirds and unity, and required de-rating of supply voltage for the centre-tap circuit. The load resistance with tee-summing should be much less than for series summing, and performance was liable to be worse.

In the second paper Dr. E. H. Frost-Smith (Elliott Bros.) and Mr. A. E. de Barr (formerly Elliott Bros. and now British Cotton Industry Research Association) discussed composite cores for instrument transductors. The major portion of the core was made of relatively cheap silicon iron, the magnetic circuit being closed by a small piece of high permeability nickel iron. The properties of the core thus closely resembled those of mumetal but at greatly reduced cost. It was shown that whereas the m.m.f. gain of a transductor without self-excitation was almost independent of the properties of the core, with 100 per cent self-excitation it was determined largely by the shape of the magnetization curve of the core material. Self-excitation tended to neutralize the effect of the induced e.m.f. in the secondary circuit, causing the transductor to become markedly dependent of core characteristics.

Owen Falls Scheme

YESTERDAY (Thursday) the Owen Falls hydro-electric scheme of the Uganda Electricity Board on the River Nile was officially inaugurated by Her Majesty the Queen who, as reported on page 792, bestowed a knighthood on the chairman, Mr. C. R. Westlake, M.I.E.E., and conferred honours on other officers of the Board. An illustrated description of the Owen Falls scheme (ultimate capacity 150,000 kW) will appear in our next issue.

According to the Kampala correspondent of *The Times*, it was announced on Monday that the Egyptian Government had paid to the Uganda Government £980,000 in compensation for loss of hydro-electric power at the Owen Falls Dam. After negotiations in 1948 and 1949 the two Governments agreed that the dam should be built one metre higher than would be necessary for generating power, so that Lake Victoria could be used to store water for Egypt. It was also agreed that the Uganda Electricity Board should control the flow of water through the dam in accordance with the wishes of the Egyptian Government. Such control, however, would deprive the Uganda Electricity Board of some of the hydro-electric power that would otherwise have been available, and the Egyptian Government therefore agreed to pay compensation to the Board.

Air Pollution

IN a James Clayton paper entitled " A New Frontier: Air Pollution Control " which he presented before the Institution of Mechanical Engineers on 23rd April, Mr. F. S. Mallette brought together a large amount of information on legislation and local action taken in various localities and by large industries in the U.S.A. to deal with air pollution. Especial reference was made to the serious effects of a five-day fog in 1948 in Donora, an industrial town in south-west Pennsylvania. Neither in this case nor in that of London in 1952 did the inquiries made offer a satisfactory explanation of the disastrous effects. Experiments carried out by the U.S. Public Health Service, however, suggested that they might be due to some combination of gases which would be more toxic than would any gas by itself.

OVERSEAS ELECTRICAL TRADE

Continued Improvement in Exports in March

THE improvement in electrical export trade apparent in February continued last month on an even more encouraging scale. Not only was the March total (£16,944,718) £3,499,832 higher than that for February but £1,881,241 above the March, 1953, figure. For the first quarter of the year the total at £45,380,421 showed an advance of £1,196,702 over the corresponding period of last year.

Trade was particularly good in electrical machinery, rising from £7,233,543 in January–March, 1953, to £8,106,584 in the first three months of this year. A notable feature was the increase from £8,613 to £709,947 in purchases by Russia which thereby became the third most important buyer. Only Australia (£1,076,159) and South Africa (£855,260) bought more, these two countries also accounting for the largest amount of other types of electrical machinery exported, with respectively £1,111,911 and £1,029,764.

A reduction from £1,142,577 to £355,591 in shipments to South Africa was largely responsible for the decline from £4,543,660 to £4,225,089 in exports of telegraph and telephone apparatus. The figure would have been lower but for increased buying in India (£599,166, compared with £247,343), Portugal (£235,844, compared with £53,564) and Brazil (£270,295, compared with £59,111). The cable market too has not been sharing in the improved trade, declining from £8,607,220 to £5,709,254. In this case the decline in business was fairly general throughout the world, with the largest buyers, India (£927,356) and South Africa (£493,672), taking only about half of the quantity for the first quarter of 1953.

A full analysis of the trade is given in Table I, with destinations shown in Table II. Apart from the items covered by these figures there are a considerable number of products dealt with in other sections of the official returns. The January–March figures for these are:—Washing machines, not exceeding 150 lb weight, £882,456 (compared with £526,785 for January–March, 1953); ditto, over 150 lb but not exceeding 250 lb, £343,805 (£310,182); ditto parts, £238,729 (£70,771); welding

TABLE I.—ELECTRICAL EXPORTS

Class	March, 1954	Three months ended 31st March	
		1953	1954
	£	£	£
Generating sets and generators:			
Diesel-driven, up to 10 kW...	99,527	274,790	287,010
Ditto, 10 to 65 kW	170,648	426,949	353,479
Ditto, 65 to 200 kW	70,396	348,899	167,793
Ditto, over 200 kW	590,852	308,698	1,125,619
Spark ignition engine driven	27,704	88,107	67,111
Steam turbine driven	139,740	161,816	149,307
Other prime mover driven...	15,811	112,937	178,215
Generators	277,393	802,545	758,507
Parts of generators	360,207	1,369,515	1,514,163
Motors, complete, other than railway, tramway and trolley-bus:			
Up to ½ h.p	193,789	337,842	532,313
Over ½ h.p. but under 1 h.p.	54,163	110,587	135,491
1 h.p. to 250 h.p.	420,526	1,319,592	1,242,791
Over 250 h.p.	191,406	378,139	473,319
Railway, tramway and trolley-bus motors complete and parts of all motors...	178,463	469,162	479,742
Motor starting and controlling gear	226,208	723,965	641,724
Converting machinery	39,027	81,005	81,488
Mercury-arc rectifiers	26,577	184,557	152,831
Transformers for lighting, heating and power (incl. coils)	1,269,101	3,162,693	3,218,279
Switchgear and switchboards (not telegraph or telephone)	1,471,208	3,975,368	4,176,915
Primary batteries:			
Lighting	57,616	143,186	203,454
Radio	162,169	228,949	433,826
Other	48,815	161,826	137,312
Parts (excl. carbons)...	68,604	67,564	187,140
Lamps:			
Filament, exceeding 24 V	89,255	188,046	213,087
Ditto, under 24 V	29,407	58,525	96,722
Discharge lamps, fluorescent tubes, etc.	68,388	121,486	195,420
Other lamps	16,676	48,121	122,032
Radio and television, etc., apparatus:			
Cathode-ray tubes	10,864	23,483	28 415
Other valves (not X-ray)	189,257	527,616	470,210
Radio and television transmitters	57,607	196,347	177,092
Commercial radio and radar equipment	1,219,493	2,226,231	2,937,588
Domestic radio receivers, mains	172,446	605,668	438,372
Ditto, battery	55,053	137,240	156,074
Ditto, other (inc. car)	10,399	57,894	29,320
Radiograms	38,645	151,747	91,778
Television sets	32,274	111,522	39,169
Public address equipment	74,757	153,690	185,296
Sound reproducing app. n.e.s.	19,850	43,226	52,467
Components and parts n.e.s., incl. parts of valves and c.r. tubes	635,047	1,293,851	1,591,554
Telegraph and telephone installations	626,253	1,576,211	1,872,126
Telephone instruments, separately consigned	129,229	665,026	371,977
Telegraph and telephone parts	468,880	1,916,654	1,393,866
Line apparatus for long distance commun.	154,845	385,769	587,120
Cookers	63,445	161,168	162,771
Toasters	26,128	49,924	48,015
Other cooking apparatus	36,613	52,440	79,478
Parts and accessories	48,613	79,203	104,548
Space heating appliances	43,959	68,288	99,825
Water heating appliances	31,567	81,438	84,272
Other heating appliances	47,100	88,391	115,032
Parts and accessories	44,665	149,608	131,603
Irons	72,459	120,079	186,932
Arc welding equipment, a.c.	36,254	164,408	111,679
Ditto, d.c.	89,094	112,884	152,007
Resistance welding equipment	6,352	39,366	28,544
Magnetos, ignition	11,739	89,816	46,793
Sparking plugs...	149,928	359,193	448,261
Elec. appliances for aeroplanes, n.e.s.	190,197	358,711	713,389
Ditto, for motor vehicles, n.e.s.	298,843	542,201	723,613
Ditto, for cycles, n.e.s.	99,885	161,577	252,372
Signalling app. (incl. traffic signals)	64,016	172,188	173,191
Industrial radio-frequency equipment	30,283	41,172	74,896
Bell app. (not telegraphic or telephonic)	10,430	21,772	24,283
Instruments, commercial	164,202	407,498	461,236
House service meters (not prepayment)	123,176	226,915	333,172
Ditto, prepayment	29,500	35,434	49,558
Electro-medical apparatus (not X-ray)	45,720	108,952	132,403
X-ray apparatus (excl. tubes and valves)	46,332	207,646	131,697
Vacuum tubes	22,891	76,363	62,608
Desk fans	41,953	103,507	90,095
Ceiling fans	121,880	329,610	303,706
Vacuum cleaners	207,467	385,439	598,702
Floor polishers	94,180	149,301	332,258
Food mixers	64,909	117,716	135,688
Hair clippers and dry shavers	137,825	84,657	240,417
Other portable appliances	27,004	60,089	79,492
Parts	91,338	123,973	234,128
Portable elec. tools (not saws) and parts	153,860	417,738	424,109
Cables and wires:			
Telegraph and telephone, submarine	105,959	228,077	205,341
Ditto, other	484,792	2,105,932	1,336,758
Cotton, silk or art. silk insulated	50,606	224,357	126,937
Enamel, glass or asbestos insulated	72,029	286,992	204,200
Paper insulated	788,063	3,289,663	2,054,438
Rubber insulated	442,982	1,473,917	1,120,761
Other	260,275	998,282	660,819
Accumulators for motor vehicles	181,737	420,658	476,214
Ditto, traction...	30,339	41,955	92,272
Ditto, radio and other portable	41,466	89,656	95,195
Ditto, other	71,375	183,559	181,263
Parts and accessories	70,614	169,760	181,927
Elec. porcelain, etc. (incl. insulators)	93,967	275,597	292,632
Insulating cloth and tape	44,570	119,267	128,554
Other insulating material	87,488	158,614	235,914
Permanent magnets	43,754	96,494	116,207
Radio, telegraph and telephone testing equipment, n.e.s.	68,363	74,182	128,408
Scientific elec. instruments (not telegraphic or telephonic)	174,019	455,864	550,758
Electrical machinery, n.e.s.	164,289	242,198	355,116
Electrical apparatus and appliances, n.e.s.	635,749	1,782,966	1,718,420
TOTAL	16,944,718	44,193,719	45,380,421

TABLE II.—DISTRIBUTION OF ELECTRICAL MACHINERY, APPARATUS AND APPLIANCES

Country	March, 1954	Three months ended 31st March	
		1953	1954
	£	£	£
Channel Islands	60,254	125,572	160,378
Gibraltar	11,271	78,581	27,801
Malta and Gozo	78,331	113,370	184,347
Cyprus	74,846	102,513	216,423
Sierra Leone	10,427	56,051	33,881
Gold Coast	113,080	312,030	270,499
Nigeria	130,368	534,164	400,272
Union of South Africa	1,715,851	5,668,648	4,604,735
Northern Rhodesia	106,123	412,154	278,223
Southern Rhodesia	275,922	796,789	607,211
Tanganyika	37,152	179,591	117,185
Kenya	131,227	787,953	537,922
Uganda	60,267	150,054	306,740
Nyasaland	10,694	29,493	29,626
Mauritius	20,905	73,674	58,829
Aden	185,443	482,621	379,233
Bahrain, Qatar and Trucial Oman	265,449	276,111	425,659
Kuwait	169,672	473,314	544,597
India	1,594,782	4,941,473	4,154,375
Pakistan	571,000	623,192	1,743,721
Singapore	506,064	950,527	882,024
Federation of Malaya	414,950	871,707	763,588
Ceylon	174,970	407,338	390,585
British North Borneo	62,911	81,245	118,155
Hong Kong	164,530	682,095	422,548
Australia	1,316,737	4,902,850	4,335,619
New Zealand	1,092,202	2,670,226	2,493,208
Canada	509,413	1,733,717	1,526,356
Jamaica	65,410	163,839	197,750
Barbados	16,535	51,872	35,004
Trinidad	88,160	160,738	274,502
British Guiana	46,066	73,650	117,397
Anglo-Egyptian Sudan	154,130	267,451	331,918
Other Commonwealth countries	158,712	394,285	382,313
Irish Republic	315,780	974,685	830,837
Soviet Union	388,811	58,849	922,094
Finland	50,152	239,716	315,393
Sweden	398,717	805,745	940,111
Norway	168,407	684,396	660,886
Iceland	10,551	34,736	30,258
Denmark	172,147	236,997	616,454
Poland	21,946	412,718	278,032
Western Germany	114,528	233,609	318,142
Netherlands	668,450	1,235,707	1,611,167
Belgium	274,725	725,586	912,248
France	423,901	620,626	1,073,047
Switzerland	91,488	192,885	227,011
Portugal	357,207	279,747	959,279
Spain	365,157	763,013	828,334
Italy	269,562	533,504	706,368
Austria	74,071	108,776	276,811
Czechoslovakia	60	25,454	8,217
Yugoslavia	191,559	234,984	316,853
Greece	86,156	230,172	191,838
Roumania	544	170,012	820
Turkey	73,529	435,608	231,502
Netherlands Antilles	7,383	59,109	19,522
Belgian Congo	46,468	94,369	89,848
French Morocco	22,740	114,406	74,840
Angola	9,174	46,452	37,003
Portuguese East Africa	17,663	79,093	65,921
Syria	30,899	70,506	68,973
Lebanon	19,631	98,090	82,857
Israel	36,115	187,889	118,389
Jordan	6,695	41,273	49,409
Egypt	110,666	354,007	321,125
Libya	8,738	51,883	29,714
Saudi Arabia	39,180	101,102	136,461
Iraq	113,565	622 561	668,747
Iran	22,799	62,486	75,321
Burma	160,450	259,114	397,156
Thailand	189,079	439,245	233,794
Indonesia	45,142	267,647	133,815
Japan	57,942	119,480	163,771
United States of America	339,708	499,033	833,495
Cuba	25,093	44,934	69,724
Mexico	19,486	84,219	55,648
Colombia	63,502	200,167	160,232
Venezuela	115,037	452,823	439,570
Peru	15,182	87,016	73,649
Chile	12,952	91,088	53,023
Brazil	139,055	308,740	337,318
Uruguay	130,394	53,367	238,318
Argentine Republic	77,024	57,699	298,029
Other foreign countries	151,654	379,508	446,423
TOTAL	16,944,718	44,193,719	45,380,421

electrodes (excluding carbons), ferrous £200,240 (£328,628); ditto, non-ferrous, £51,249 (£115,962); electric conduit tubes and cased tubes £205,817 (£255,412); and electric locomotives £755,366 (£630,189).

Netherlands (£480,764), United States (£185,499) and Western Germany (£137,501) supplied most of the £1,263,145 worth of electrical machinery and apparatus imported in March. The three months' total was £3,549,427, compared with £2,115,326 for the first quarter of 1953.

Society of Engineers' Centenary

TO mark the centenary of its inauguration the Society of Engineers (Incorporated) of which H.R.H. the Duke of Gloucester has consented to become a patron, is holding four days of celebrations in London from 4th to 7th May, culminating in a centenary banquet in the historic hall of the fourteenth century Fishmongers' Company, beside London Bridge and close to an early meeting place of the Society. At the banquet the Churchill Gold Medal, awarded every two years for the most noteworthy contribution to contemporary engineering, will be presented to Sir William Wallace, C.B.E., chairman of Brown Brothers & Co., Ltd., for his part in developing ship stabilizing gear.

Headed by an impressive list of Fellows and Hon. Fellows, including Sir Winston Churchill, Professor Huxley, Lord Nuffield, and Sir Frank Whittle, the Society is a national professional one which covers all branches of engineering in Great Britain. There are members in most civilized countries, a separate Division in Australia, and many members in such developing areas as India, Pakistan, Africa and Canada.

One hundred years of development in each of these main branches of engineering will be depicted in four papers which are to be presented at the main business sessions of the celebrations on 5th May, at the Geological Society's apartments at Burlington House, Piccadilly. The papers will be presented by the following engineers: Civil, Sir Murdoch MacDonald, the Aswan Dam designer; mechanical, Mr. George Constantinesco; electrical, Sir Robert A. Watson-Watt; and aeronautical, Sir A. H. Roy Fedden.

The celebrations will open on 4th May with a conversazione at the Science Museum, South Kensington, and 6th May will be ladies' day, the programme for which will include a trip on the River Thames and an inspection of the Lafarge Aluminous Cement Company's works at West Thurrock. The president this year is Mr. Walter R. Howard, who will forecast some revolutionary developments in concrete work in his presidential address.

The Scottish branch of the Society, of which Mr. Alexander Mason is chairman, will hold its celebrations on 15th May, by the delivery of the first "Baker Lecture" instituted to honour Sir Benjamin Baker, builder of the Forth Bridge, and a dinner at the headquarters of the Royal Society of Edinburgh.

The highlight of the celebrations of the Australian Division will be a reception and dinner in Sydney. The Divisional president is Emeritus Professor Sir Henry Barraclough, who was Dean of the Engineering Faculty, Sydney University.

INDUSTRIAL NEWS

Belfast Plant Contracts

THE PROLONGED controversy over the placing of the orders for the new Victoria power station, Belfast, has now been brought to a close by the announcement of the Ministry of Commerce of the awards made by Sir Eyre Gordon, chairman of the Northern Ireland Joint Electricity Committee. He made his awards, under powers of an Act of Parliament authorizing him to do so. These are subject to the approval of the Minister of Commerce. The contracts are as follows:—Two turbo-alternators: C. A. Parsons & Co., Ltd. (approximately £1,477,000). Four boilers: Mitchell Engineering Co. (approximately £1,507,000). Three boilers: Babcock & Wilcox, Ltd. (approximately £1,316,000). Excavating and piling: Stewart & Partners (£115,000).

The dispute in the Corporation centred round the boilers. The new estimates show a saving on former estimates of over £153,000.

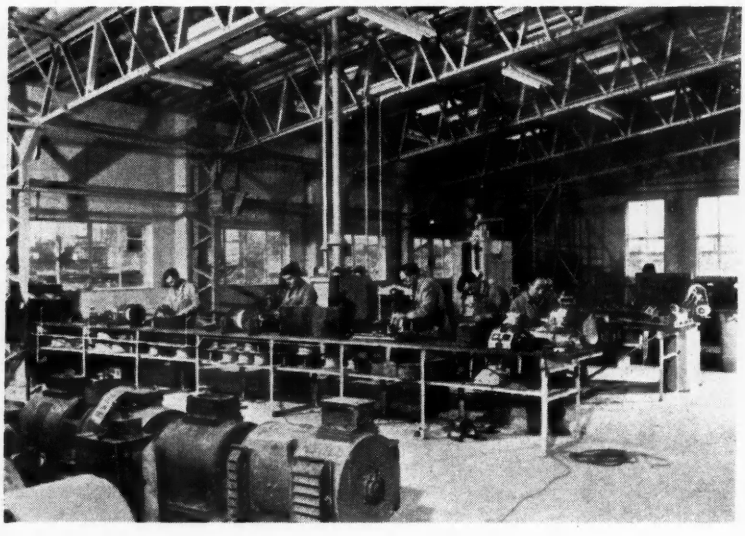
Women Engineering Workers' Wages

Following upon the increase recently granted to male workers in the engineering industry, it is announced that women workers in the industry are to receive an increase of 5s 8d a week with proportionate rises for girls. This will increase the weekly rate to £4 17s 2d (representing a rise of about 6·2 per cent), and it will date from 5th April.

New Globelite Factory

Globelite Industries, Ltd., a subsidiary of the Southern Areas Electric Corporation, Ltd., has recently moved into its new factory on the Marsh Barton Estate, Exeter. The company specializes in the reconditioning of electric motors and associated control gear, and the winding and rebuilding of transformers. The major part of its output is concerned with the repair of marine auxiliaries in which a rapid service is essential. The new factory has been specially sited and laid out with that purpose in mind. Mr. S. H. Tombs is the works manager.

A section of the new factory of Globelite Industries, Ltd., Exeter



Hoover Exhibition

Thirty-five years ago Selfridges, Ltd., were the first stores to sell Hoover vacuum cleaners. To celebrate this event an exhibition of the present-day range of Hoover products was opened on Monday on the lower ground floor of their Oxford Street premises by Miss Margot Lovell, of the B.B.C. television "About the Home" programme. Demonstrations are given throughout the day of both types of washing machine, upright and cylindrical vacuum cleaners, floor polishers and the new steam iron. The exhibition will continue until the end of next week.

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 17th April is deemed to be 150s 6d. The "cost of material" figures are:—

For electrical machinery and equipment the Board of Trade index figure published on 17th April is 155·7.

For turbo-generating and allied plant: materials used in mechanical engineering industries, 146·7, blast furnaces and iron and steel smelting and rolling (40 and 41), 143·4, price of ⅞in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 16th April), 3s 7d per lb. Outstanding contracts covered by the B.O.T. intermediate products index: the index figure for intermediate products (17th April) is 353·0.

The rate of pay changed on 5th April from 141s 6d to 150s 6d as a result of the wage increase agreed between the Engineering and Allied Employers' National Federation and the Confederation of Shipbuilding and Engineering Unions.

New Aerialite Depot

To mark the opening of a new depot at 19a and 19b, Blythswood Street, Glasgow, Aerialite, Ltd., and its subsidiary company, Nettle Accessories, Ltd., are giving a luncheon at the Grand Hotel, Glasgow, on Tuesday, 4th May. Members of the trade are being invited to the luncheon and to cocktails in the evening (5.30–7 p.m.), and a display of the products of the Aerialite group will be shown in the Morven Suite at the Hotel.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £156 0s 0d
COPPER, H.C. Electro	ton £247 10s 0d
Fire Refined 99·70%	ton £246 0s 0d
Fire Refined 99·50%	ton £245 0s 0d
COPPER Tubes ..	lb 2s 4½d
Sheet	ton £304 5s 0d
H.C. wire and strip	ton £276 0s 0d
LEAD, English ..	ton £94 15s 0d
Foreign	ton £93 0s 0d
MERCURY	flask £82 10s 0d
TIN, block (English) ..	ton £757 0s 0d
ZINC, G.O.B. Foreign	ton £79 0s 0d
Electrolytic	ton £87 2s 6d
BRASS Tubes (solid drawn)	lb 1s 11⅞d
Sheet	ton £249 0s 0d
Wire	lb 2s 6½d
PHOSPHOR BRONZE Wire	lb 3s 10½d
PLATINUM ..	oz £30 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 19½d–19⅞d

Commercial Catering Handbook

A new book, "Electric Commercial Catering Handbook," is the first on this subject to be published by the Electrical Development Association. It constitutes a handy guide to design, installation and maintenance. There are six chapters dealing respectively with equipment, what equipment to install, kitchen planning, consumption of electricity, specialized applications, and care and maintenance of equipment.

The winners of the E.D.A. Public Speaking Competition. Women's section (left to right): Miss S. Francis (third); Miss Thelma Parkinson (second); and Mrs. Joyce Hallworth (first). Men's section (left to right): Mr. J. A. B. Maben (third); Mr. P. Tatchell (second); and Mr. S. Malin (first)

The chapter on kitchen planning gives helpful guidance on the amount of equipment which is required to operate successfully typical commercial kitchens, with notes on its disposition to get the best results, combined with convenience for the staff using the equipment. In drawing up schemes for electric catering installations in restaurants, cafés and canteens, information is usually required on the proportion of the load taken by the various groups of appliances and in the chapter entitled " Consumption of Electricity " detailed advice is given on this point. Copies of this new publication (E.D.A. 1762) can be obtained from the Association at 2, Savoy Hill, London, W.C.2, price 5s.

Public Speaking Competition

The national finals of the Electrical Development Association's Public Speaking Competition were held at the Lighting Service Bureau, 2, Savoy Hill, London, on 23rd April. Nine women and ten men from all parts of England and Scotland competed.

The women's section was held in the morning and the winner was Mrs. Joyce Hallworth, a demonstrator in the New Mills District of the North Western Electricity Board, who spoke on " Bringing Electricity to Rural Areas." Second place was awarded to Miss Thelma Parkinson, a demonstrator in the Sheffield District of the Yorkshire Electricity Board, and the subject of her address was " The Housewife in the Reigns of the Two Elizabeths." Speaking on the same subject was Miss S. Francis, who was placed third. She is a trainee demonstrator at the Chester-le-Street Service Centre of the North Eastern Electricity Board. The judges were Miss Vera Norvick, assistant secretary, Electrical Association for Women, Mr. L. Marson, B.B.C., Mr. J. P. Stephenson, City of London School, and Mr. Norman Shelley, the well-known actor.

The men's contest was held in the afternoon and the winner was Mr. S. Malin, who spoke on " Life Without Electricity." He is a third assistant engineer in the South Western Electricity Board's Bristol District. Second place went to Mr. Philip Tatchell, first assistant chemist at the Little Barford generating station, Eastern Division, British Electricity Authority, who chose as his subject " The Place of Electricity in the National Economy." Mr. J. A. B. Maben was placed third. He is employed as a clerk in the Galashiels Sub-Area of the South East Scotland Electricity Board, and he spoke on " Life Without Electricity." The adjudicators were Mrs. Frank Forrest, member of the Council of the Electrical Association for Women, Mr. F. Phillips, B.B.C., Mr. B. J. Ross, City of London School, and Mr. Frank Hoare, director of Merton Park Studios. Mr. V. W. Dale, director and secretary of E.D.A., presented the shields.

French Contractors' Visit

A delegation of French electrical contractors representing the Fédération Nationale de l'Equipement Electrique recently visited this country. The party, which included Messrs. R. Comtet, president of the Federation, and M. Mallet, secretary-general, inspected sites in London and Plymouth at which the " Ductube " system of internal electrical servicing is being used. One visit included a multi-storey block of flats for Southwark Borough Council in which electrical work is being carried out by the London Electricity Board, and " Ductube " is providing lateral mains and horizontal lighting and power circuits in the hollow-pot concrete floor slabs. The whole of one day was taken up with calls on " Star " flat sites in Plymouth. At one site, where traditional accessories are being adapted, by providing access through the backs of the standard metal boxes, the foreman electrician and his mate have been able to remove the " Ductube " from the slab in the morning subsequent to pouring, and re-lay it for a further floor area within the hour. The installation is carried out on top of fabric reinforcement supported by steel shuttering.

New Fluorescent Lamps

On 1st May Thorn Electrical Industries, Ltd., adds to its home range of fluorescent tubes the new Atlas de luxe warm white. It will be available in all the usual lengths and wattage ratings.

Ekco-Ensign Electric, Ltd., also announces that from 1st May it is adding to its range of fluorescent lamps the " Ekco " de luxe warm white. This new fluorescent lamp will be marketed at the same list price as other standard " Ekco " fluorescent lamps and will be available in the usual lengths and ratings.

Amateur Radio Exhibition

The Council of the Radio Society of Great Britain has approved the plans for the 8th R.S.G.B. Amateur Radio Exhibition to be held from 24th to 27th November at the Royal Hotel, Woburn Place, London. Mr. P. A. Thorogood, general manager of the Electrical Engineers (A.S.E.E.) Exhibition, has agreed to be exhibition manager.

Junior Institution of Engineers

Hillier, Parker, May & Rowden, of 77, Grosvenor Street, W.1, have sold Pepys House, 14, Rochester Row, Westminster, S.W.1, to the Junior Institution of Engineers, which will make it its headquarters in place of the office at 39, Victoria Street.

B.N.E. Competition

Last week the judging of a competition for placing in order of importance the various features of electric cooking was undertaken by a committee of experts. The competition was organized by British National Electrics, Ltd., and the members of the committee were Dame Caroline Haslett (E.A.W.), Miss P. L.

Garbutt, A.R.I.C. (Good Housekeeping Institute) and Miss M. Gilbert (E.D.A.). Two entrants tied for the prize and both winners will be offered a B.N.E. model C.49 electric cooker, complete with 8in radiant plate, simmerstat control and storage drawer, a 3-gallon storage water heater and a model F.103 electric fire. The winners are Mrs. Hales, of Sheerness, Kent, and Mrs. Townsend, of Dorchester, Oxford. The junior competition for boys and girls under 17 years of age, has been won by Derek C. Lawford, Ringwood, Hants.

Oldham Activities

Two plants have been opened overseas this month by subsidiary companies of Oldham & Son, Ltd., for the production of "Fibrak" separators in France and Australia. Production in France is by the subsidiary company Société Francaise des Séparateurs Fibrak, at Arras, and in Australia by Fibrak (Australia) Pty., Ltd., in Sydney.

Oldham & Son, Ltd., have received official approval for a cap lamp certified safe for use in hydrogen. This is claimed to be the first approval certificate for use in hydrogen to be issued for any cap lamp, and the first for use in hydrogen to be issued for any electric lamp since the testing regulations were revised recently.

Heated Mattresses

In our description of the "Slumberland" electrically heated mattresses on 9th April (page 655) we stated that they were available with thermostatically controlled elements. Actually the control is by means of a three-heat switch, it being a feature stressed by the manufacturers that with the design adopted the unit automatically reaches a balanced and steady state of warmth without requiring a thermostat.

Bagdad Fair

The Federation of British Industries held a Press Conference last week at which Mr. D. A. Lamb, organizer of the Bagdad Trade Fair (to be held from 25th October to 8th November), who has just returned from Bagdad, explained the position as the result of recent floods. He said that although work on the site had been delayed they were not unduly worried about the position and would be able to catch up on the work. The response from British manufacturers, who included many electrical concerns, had been remarkably good.

M.-V. Easter School

The fifth school held from 21st to 23rd April by the Metropolitan-Vickers Electrical Co., Ltd., was organized to provide opportunities for those who advise and teach young men in the public schools and grammar schools to see at first hand the industrial applications of the principles of science, and to observe how these young men are prepared for responsible employment either by entering industry direct from school for combined practical and theoretical training, or through completion of a degree course and graduate apprenticeship. The school was attended by eighteen headmasters and eighty-eight science masters, and by representatives of the Ministry of Education and the Education Departments of the Institutions of Mechanical and Electrical Engineers. The arrangements included talks on, and visits to, several manufacturing departments of the factory, the Research Department and the Apprentice Training School, and provided opportunities for visitors to discuss problems of mutual interest with the staff of the Education Department and with apprentices at various stages of their education and training.

Electrical Commercial Travellers

A general meeting of the Electrical Trades' Commercial Travellers' Association will be held at the Feathers Hotel, Broadway, Westminster, S.W.1, on 14th May, at 6 p.m.

Crystal Palace Aerial Tower

The B.B.C. has placed a contract with British Insulated Callender's Construction Co., Ltd., for the design, supply and erection of a self-supporting tower to carry the aerials for the new London television transmitting station at Crystal Palace. It will be 640ft high and of lattice steel construction, tapering from 120ft square at the base to 9ft 6in square at the 440ft level. Between 440ft and 600ft the tower will have parallel faces 9ft 6in across; on this portion will be mounted eight stacks of four dipoles forming the Band I transmitting aerial. Above this there will be a topmast 40ft high and 2ft 6in square. Provision is made at the 440ft level for the installation of dish-type receiving aerials for picking up outside broadcast transmissions. There will be a hoist between this level and the ground.

The tower will be equipped with aircraft warning lights to comply with the requirements of the Ministry of Transport and Civil Aviation. It is expected that the main structure will be completed by the autumn of 1955.

Advertising Conference

The Advertising Association is holding its annual conference from 6th to 9th May at Bournemouth. The aim of the conference is to produce a national plan which will help British industry to meet the new conditions brought about by the buyer's market and the competition now being faced in the export markets. The speakers will include Mr. L. C. Gamage, vice-chairman and joint managing director of the General Electric Co., Ltd.

Trade Announcements

"Beeantee" Illuminations (London) Ltd., announces that its festoon strip-lighting holders have now been modified to take the 7/029 new and old standard t.r.s. cable, and also the 3/036 t.r.s. cable.

The **Acme Electric Co. (Finsbury), Ltd.,** has taken over the Streamlite Electric Lamp Co., Ltd., at 99, Great Eastern Street, London, E.C.2 (telephone: Clerkenwell 0708/9) where it has opened new showrooms and a trade counter.

Catalogues and Lists

Decca Radar, Ltd., 1–3, Brixton Road, London, S.W.9.—16-page cartoon illustrated booklet dealing with "Decca 45" radar equipment.

Refrigerator Components, Ltd., 1 & 2, Greycoat Place, London, S.W.1.—Illustrated priced folder on the "Ezi-Charge" filter dryer unit.

Brush Coachwork, Ltd., Falcon Works, Loughborough.—Illustrated publication dealing with "Brush" battery-electric industrial transport.

Dimplex, Ltd., Totton, Southampton.—Leaflet and price list illustrating the company's range of oil-filled electric radiators.

George H. Scholes & Co., Ltd., Wylex Works, Wythenshawe, Manchester.—Priced leaflet introducing Wylex "Extenso" fuse control units.

Hoffmann Manufacturing Co., Ltd., Chelmsford, Essex.—20-page booklet entitled "A Sketch of the Manufacture of Ball and Roller Bearings" together with a leaflet on "Hoffmann" precision miniature bearings.

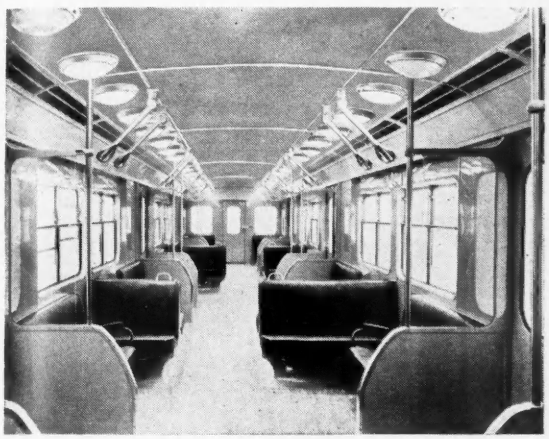
Bailey Meters & Controls, Ltd., Progress Way, Croydon.—Technical leaflet presenting "Bailey" temperature indicators (M.19).

Veritys, Ltd., Aston, Birmingham, 6.—Illustrated priced broadsheet showing a complete range of the company's tungsten, mercury and sodium equipment.

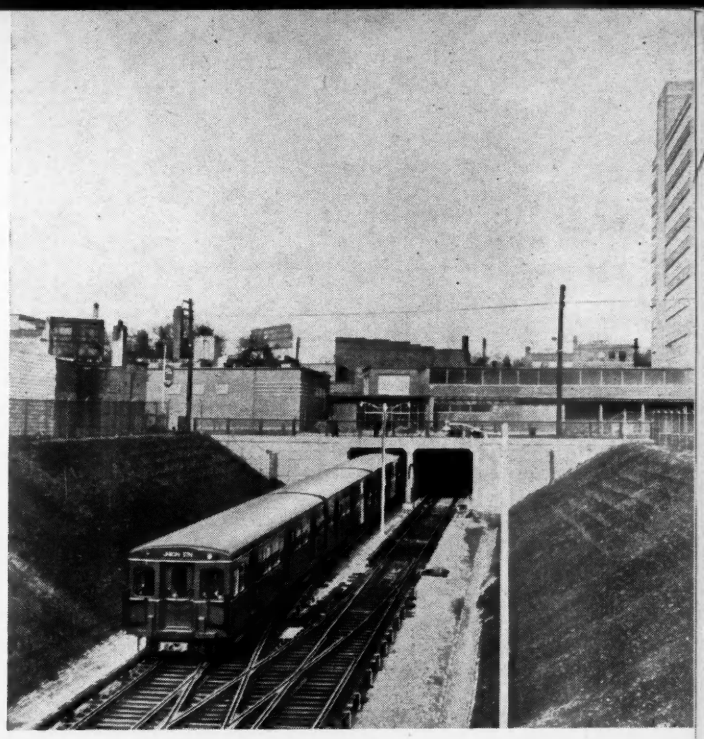
A part of the new showrooms of Chilton Electric Products, Ltd., at 19, Old Queen Street, London, S.W.1, the opening of which was reported in our issue of 16th April

The Toronto Subway

British Equipment for Canada's First Underground Railway



Each car will accommodate 230 passengers, with seats for 62



THE new electric railway in Toronto is believed to be the first underground railway to be established in Canada. It runs from north to south under the main traffic artery from the northern outskirts to the heart of the city and has been planned to carry 40,000 passengers an hour, an increase of 26,000 over the capacity of the tramcars which the new railway is to replace. An initial double track about 4½ miles long terminates at Eglinton in the north and Union Station in the heart of Toronto. About 2·7 miles of the railway is underground and the rest is above ground.

The track gauge of 4ft 10⅞in will allow the existing tramcars to run over the railway track if desired. A third conductor rail has been adopted, with earth return running rails, the live rail being laid outside the running rails and covered by L-shaped boards to prevent accidental contact. The Gloucester Railway Carriage & Wagon Co., Ltd., has supplied or is supplying 104 rapid transit cars for this railway. The cars are each 57ft long and 10ft 4in wide and will accommodate 230 passengers, with seats for 62 persons. Both accelerating and braking rates are high, the high rate of acceleration being achieved by motoring all axles.

The multiple-unit train sets are made up of one to four two-car units according to traffic requirements, and coupling for multiple-unit working is effected by fully automatic electro-pneumatic couplers provided by G. D. Peters & Co., Ltd. These are fitted at the leading end of each car, with switch control from within the cab giving coupler lock and change-over of electrical and air controls for through working. Each car of a unit has a driving cab at the outer end which may be used either by the driver or the guard; it is small and compact, occupying only a third of the car width. One car of each two-car unit carries the air compressor, while the other carries the auxiliary motor-generator set. The superstructure, comprising the car underframe and body, is of all-steel integral design. Elaborate precautions have been taken against fire risk, and the body panels are specially insulated against both noise and vibration. The car interior is lined with " Formica " plastic sheeting. Four cars are of aluminium alloy, and to assess comparative current consumption these and four steel cars are fitted with kWh meters.

Electro-pneumatic Door Operation

There are three electro-pneumatically controlled double-leaf doors on each side of the car, and in case of emergency a pair of doors can be operated from either inside or outside the car. The patent electro-pneumatic door system, by G. D. Peters & Co., Ltd., is controlled by the guard from a driving cabin not currently in use by a driver. Where more than one guard is on duty, the control is divided by an automatic zoning feature, initiated by the action of the guards unlocking the door controls.

The power-operated doors in each car are electrically interlocked and, through a relay, combine into an interlocking system for the whole train, revealing to the guard by indicator lights the state of the doors and by exterior lights showing where doors are open or prevented from fully closing. The interlock system also feeds a traction relay, thus ensuring that motive power is only available when all doors are closed. A buzzer provides for communication between guards and the driver, while in the reverse direction the driver is provided with a bell signal. Individual doors can also be isolated from the main system, in addition to complete car isolation, and in neither case are the remaining doors or the interlocking system affected.

The pneumatic system l.p. reservoir is charged from the main air pressure line through a compact air supply unit incorporating air filter, isolating cock with isolating switch, pressure-reducing valve and pressure gauge. The

air supply unit also passes through it the cleaned unreduced brake pressure and, through the separate isolating cock, reducing valve and pressure gauge, a reduced air pressure for the control equipment. The door system is protected by a blow-off type safety valve.

The suspension system is by laminated springs and triple-coil helical springs with spring-loaded friction pads to provide damping. Roller bearings and solid steel wheels are used. Each truck has a third rail shoe on each side for current collection from the top surface of the third rail. There are also pneumatic tripcock devices to effect automatic emergency stops should the train be operated beyond a red signal light. The bogies are of the Gloucester Company's design and arranged to mount two driving motors per bogie, with hypoid gear axle units by David Brown & Sons. The motors are frame-mounted and consequently spring-borne, not axle-hung as has hitherto been conventional practice on railways.

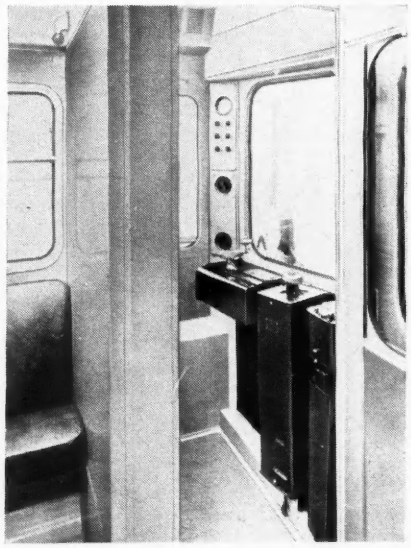
Traction Motors

The traction motors, which are by Crompton Parkinson, Ltd., are a development of similar equipment supplied to London Transport. A total of 440 68 h.p. motors is being supplied, these motors being series-wound, operating with pairs permanently in series across the 600 V supply. Designed to operate with field diversion to give fast running the motors will accelerate a fully loaded car at the high rate of 2 m.p.h./sec, and are capable of a top speed of about 55 m.p.h. The motors have skewed slots to minimize noise and are ventilated by their own individual fans drawing clean air through ducts from inside the body of the coach.

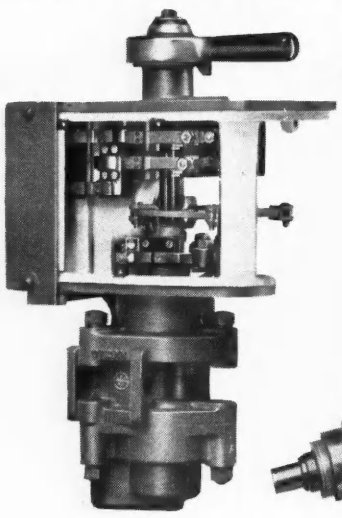
Four motors are fitted to each car so that every axle throughout the train is motored. They are frame-mounted in the bogie on resilient rubber bushes shunted with flexible copper braids to anchor the motor frames to running-rail potential. The drive is through cardan shafts to gearboxes the gear ratio being 7·43 : 1 which, with a wheel diameter of 30in, results in a motor speed of 831 r.p.m. at 10 m.p.h. The motors are rated on 60 per cent field strength but are designed to operate at 50 per cent if required; at present the minimum setting is 52 per cent. The conventional long cables out of the motors have been eliminated; instead, quickly-detachable connecting posts have been fitted as these simplify the removal of the motors for periodic maintenance.

The control scheme, which is by the British Thomson-Houston Co., Ltd., provides for series-parallel control of the four motors on each car. The trains are under multiple-unit control from one driving position. All main items of traction control equipment, including two line breakers, camshaft accelerating unit, reverser, series-parallel transfer switch, field shunting contactors, and accelerating, volt-ampere and overload relays, etc., are mounted in an aluminium-alloy unit carried on the underframe. Easily removable dust-proof covers are fitted. The two line breakers are fitted with extension arc chutes which project from the framework. All power cables are fitted with quick-release connectors, thus enabling the complete unit to be removed quickly from the underframe.

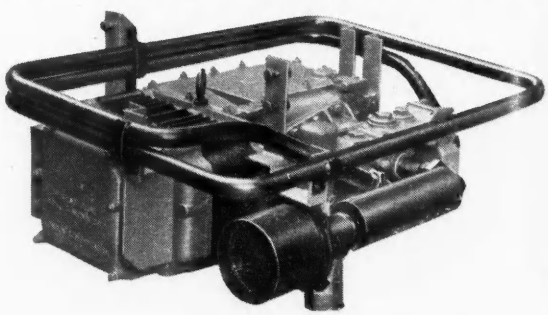
Because of the confined space in the driver's cab most of the auxiliary electrical equipment is flush-mounted. The partition behind the driver accommodates control and auxiliary cut-out switches, fuses, door control switch, traction control equipment cut-out switch, ammeter and test sockets, and cab heaters with their switches. The master controller, of the shallow desk type, is cam operated and has only three operating positions. By means of an accelerating rate switch, the driver can select any one of three accelerating rates; this enables the acceleration to



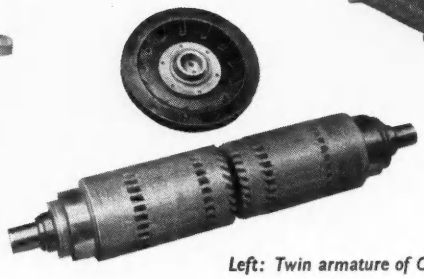
There is a driving cab at the outer end of each car



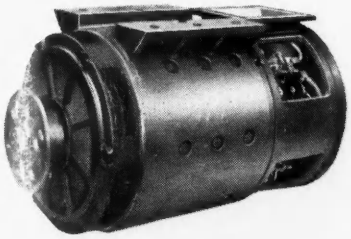
Left: Controller handle of Westinghouse electro-pneumatic brake showing electrical contacts



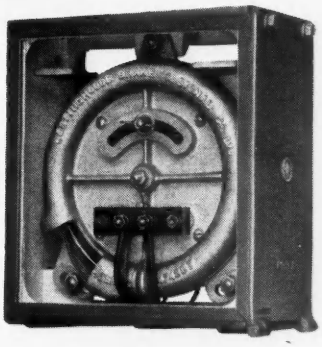
Above: Westinghouse two-stage electrically driven compressor and intercooler



Left: Twin armature of Crompton Parkinson m.g. set



Crompton Parkinson C95 coupling end traction motor



Westinghouse retardation controller

be maintained under varying load and rail adhesion conditions. To ensure that a train is operated from one position only, the driver is provided with a removable key which operates a driver's control switch and is trapped in the "on" position. This key also operates the traction control equipment cut-out switch.

Variations from British Practice

A number of electrical features on the cars are different from normal British practice. The master controller is operated by the driver's left hand and is fed from a traction control relay, the operating coil of which is energized through the door interlocks, of which there are 96 in series on an eight-car train. A combined door cut-out and interlock shorting switch is provided for each door. In addition, a sealed master-switch in the driving cab can be used in an emergency to cut out the traction control relay. The starting signal is visual and not audible. The door circuits are designed to cater for a maximum of four operational guards on one eight-car train. The zoning feature operates automatically and divides the train into the same number of zones as there are guards. Both forward and rearward door "open" and "close" control push-buttons are provided. Guards can signal to each other and to the driver by buzzer, but the driver can only signal to the guard by bell. Thermostatic heating control is provided.

The brake equipment on the cars is of the self-lapping electro-pneumatic type with retardation control made by the Westinghouse Brake & Signal Co., Ltd. The service brake is an electrically-controlled compressed air brake, providing simultaneous and rapid application or release on all cars, irrespective of the length of train. The brake can be graduated in application or release, and the driver's brake valve is self-lapping to give a brake force according to the degree of handle movement made by the driver. The retardation control is fully automatic in operation, and limits the retardation to a predetermined maximum, regardless of the brake force applied by the driver, the speed at the start of or during an application, and the loading of the train. The Westinghouse automatic air brake, which operates by reduction of pressure in a brake pipe continuous through the train, is added to the electro-pneumatic brake to give emergency applications.

The lighting and heating systems have been supplied by J. Stone & Co. The fixtures are of the incandescent type, one fixture over every seat giving an illumination of 25 ft-candles on the reading plane. In the case of a power failure, battery-operated emergency lights will function automatically. Heating and ventilation are provided from underfloor resistors of 30 kW capacity over which air is circulated to the car through seat pedestal louvres. Thermostatic control provides a temperature of 62–65 deg F and a combination of fresh and recirculated air is available.

Crompton Parkinson, Ltd., supplied the batteries and m.g. sets for the auxiliary supply at 50 V. The generator is capable of a continuous output of 4 kW, its motor being supplied from the track at a nominal 600 V. This low-voltage system is provided in order to operate the various components controlling the traction motors, doors, brakes, heating, ventilation and other features.

The m.g. set consists of two similar armatures on a common shaft surrounded by a common frame containing two independent field systems, thus reducing space and weight to the minimum. By suspending the m.g. set from the underframe with rubber blocks and employing duct ventilation from inside the coach, noise is reduced and internal cleanliness ensured. An interesting feature is that the full output from the generator is obtainable no matter whether the track supply falls as low as 450 V or rises as high as 600 V. The output is controlled by a carbon-pile regulator normally giving a constant-voltage characteristic but including a current-limiting device which is operative, for example, when a full auxiliary load coincides with a discharged state of battery. The battery itself has ample capacity to carry all the control loads as well as to supply the emergency lighting for long enough to complete a round trip on the railroad or to take the train out of service and unload the passengers. To reduce unnecessary capital expenditure the batteries and m.g. sets have been made of such a size that one set can supply the requirements of two cars.

Special attention was paid to the future problem of stocking spare parts; to this end the two cores, commutators, brushgear and brushes are interchangeable, with the exception that the motor type commutator segments have to be re-slotted to accommodate the heavier generator windings. The motor has only series excitation and, in the interests of stability while passing conductor rail gaps, is without shunt or separate speed limiting windings.

Electrodeposition Conference

THE fourth international conference on electrodeposition and metal finishing was held in London from 21st to 24th April. More than thirty papers were presented by delegates from Canada, France, West Germany, Italy, the United States and Great Britain (who contributed fourteen). Separate sessions were allocated to anodic processes; fundamental aspects; chromium and tin coatings; nickel plating; American electro-plating practice; organic finishing; electrodeposition; and the future. Problems for which solutions were urgently needed were said to include the establishment of a reliable corrosion test for plating and the development of processes to give a ductile bright nickel deposit and a satisfactory cyanide-copper electrolyte. An international co-operative effort directed by a central authority and utilizing the resources in laboratories in Europe and the United States was advocated. Other papers coming under the heading of the future related to glass-fibre reinforced plastics as non-conducting linings for equipment and to a process for making porous electrodeposits.

THE B.E.A.M.A. IN 1952–53

Points from the Annual Report

REVIEWING the Association's work during the past year, the Council of the British Electrical and Allied Manufacturers' Association says that the industry continued very active and progressive. Despite many handicaps outside its control the industry again proved its ability to adapt itself to prevailing conditions and the year was one of notable achievements.

Reference is made to the harmony of interests between the Institution of Electrical Engineers and the Association as exemplified by the tenure of office of President of the I.E.E. during 1953–54 of Col. Leeson, the director of the Association. General conditions for export contracts (including complete erection) have been approved by the I.E.E. and the Institution of Mechanical Engineers and the "B1" conditions (excluding erection) are being revised. The B.E.A.M.A. is associated with this work.

Although the amount of generating plant commissioned by the British Electricity Authority in 1953 (1,413 MW) was lower by 127 MW than the record figure for 1952 it represented a considerable achievement. It is evident, however, that the rate of commissioning of plant must be increased to meet the growing demand. This has been consistently urged by the B.E.A.M.A. representatives on the Heavy Electrical Plant Consultative Council; an addition of 2,000 MW a year is generally acknowledged to be the minimum required. Apart from this, 1,000 MW a year has to be produced for overseas markets.

Manufacturers' representatives secured the withdrawal of a Government direction to give precedence to plant for export and the Minister of Supply (chairman of the Council) set up a small sub-committee to discuss with the Ministry of Fuel and Power the removal of the limitation of 1,550 MW a year. As a result a tolerance of 600 MW above that limit, over a period of three years, has been obtained.

In July last the first section of the 275 kV grid was commissioned; when completed this will be the largest integrated transmission system in the world. It is of value in providing British manufacturers with experience of high voltage installations at home as well as overseas.

Mr. D. D. Walker, chairman of the B.E.A.M.A. Council, has succeeded Sir John Hacking as chairman of the Joint Committee between the B.E.A. and Area Boards and the B.E.A.M.A. Good progress was made by the Committee in such fields as transformer and switchgear standardization and general conditions of contract.

Co-operation also continued between the Association, the B.E.A. and Boards and the British Electrical Development Association in furthering their common interests. Public relations consultants were engaged to form a link, under the guidance of the B.E.A.M.A., between the manufacturing industry and E.D.A., Women's Institutes, the Press, the B.B.C. and Members of Parliament.

One section of the report deals with the Association's representations about purchase tax and its endeavours to secure relief from the effects of uncertainty induced by the tax. Action taken with regard to proposed legislation is also noted.

Steady headway is reported to have been made on the Continent and among United Kingdom contractors by the General Conditions for the Supply of Plant and Machinery produced by a working party set up by the Economic Commission for Europe and additional conditions are being drafted. In spite of the general desire to be able to quote firm prices, the continuing unsettled conditions have justified the retention of the B.E.A.M.A. contract price adjustment clauses.

The Association's share in extending the Electrical Power Collection at the Science Museum, South Kensington, and the presentation of the silver rosewater dish and ewer to Cambridge University are referred to and the proceedings at the fifth British Electrical Power Convention last year are reviewed. Mention is made of preparations for a third edition of the B.E.A.M.A. Catalogue, the Electrical Engineers' Exhibition, the British Industries Fair, and various bodies with which the Association is connected. Two further editions of "Public Transport Information," explaining the advantages of electric road passenger transport, were published during the year. B.E.A.M.A. firms are arranging visits to their works by delegates to the International Railway Congress to be held in London next month.

Overseas Trade

Fully one-third of the industry's total production is exported and its exports are now approaching ten times the pre-war value. There was a slight decline in 1953 but this was not unexpected and was due to a general reduction in world trade. The decrease was not shared by all sections; in 12 items out of 43 listed in a table in the report there were increases, particularly in transformers, switchgear, turbines, radio, lamps and locomotives. The Council says that there is no need to regard the future with pessimism. Reference is made to the work of the Export Panel and the B.E.A.M.A. Overseas Committees.

After a reference to tariff board inquiries in Australia and New Zealand with which the Association was concerned, the report comments on import restrictions and exchange controls imposed by overseas countries for balance of payments reasons or as a means of protecting local industries. Recent relaxations of restrictions by Australia and New Zealand are welcomed and it is noted that South Africa has made several increases in import quota values. The position in respect of Argentina and Brazil is said to be far from encouraging; no import licences for United Kingdom goods have been granted by Brazil since June last year.

The Association is watching very closely the general review which is to be made of the General Agreement on Tariffs and Trade (G.A.T.T.) and the export director (Mr. D. Maxwell Buist) is a member of an F.B.I. committee formed to review the Agreement and enable the F.B.I. to formulate recommendations to the Government.

Advice and assistance was again given during the year to the Sub-Committee on Electric Power of the Economic Commission for Asia and the Far East. Mr. Buist was a member of the Government Trade Mission to the Middle East whose report is to be issued shortly. The report refers to the forthcoming British Trade Fair in Baghdad, to which great importance is attached, and to the report of an F.B.I. mission upon the operations of the International Bank for Development and Reconstruction containing recommendations for increasing the United Kingdom's share of the business financed by the Bank.

"East–West" trade is a subject in which, the report says, the electrical industry is vitally concerned. Control of "strategic" materials continues and is particularly stringent in the case of China. All permitted exports require licences but the ban excludes most types of electrical machinery. The control of exports to Russia is not so severe; such equipment as power transformers and small electric motors and generating sets may be supplied to that country, but there is still an embargo upon generating equipment and motors exceeding 375 kW/500 h.p. These controls are now being examined and the outcome is anxiously awaited for the urgency of knowing where industry stands cannot be overstressed.

Competition from Germany has increased and will continue. Last year German electrical exports were valued at £105·3 million, half the British total, but the rate of growth fell. Continental competitors are resorting to "incentives," price-cutting and extended credits to secure business. B.E.A.M.A. members have given much attention to the Continental practice of quoting firm prices. While this has been found possible for certain ranges of products for delivery periods of up to 18 months, the risks of labour and material variations during the longer periods of manufacture make it impracticable to depart from the protection of the contract price adjustment clauses.

It is expected that Japanese competition will be felt more strongly in future. During the past year Japanese electrical manufacturers made 27 technical agreements with foreign concerns, over half of them American. The agreements included steam and water turbines and all classes of electrical machinery and apparatus.

Council Committees

Several pages of the report are devoted to summaries of the work of Council Committees. The Contract Conditions Committee arrived at agreements with the National Coal Board and the Railway Executive and it also dealt with matters arising out of the South African Railways' contract conditions and those of the U.S. Mutual Security Agency for "off-shore" purchases.

Following the recommendations of the F.B.I. mission to South America (led by Sir Arthur Fleming, chairman of the B.E.A.M.A. Education Committee) much progress has been made in establishing a scholarship scheme for training South American engineering students in this country. Arrangements are being made to offer vacancies for Arab students and a close liaison has been established with the Indian and Pakistani Governments in securing vacancies for their nationals. Other matters dealt with by the Education Committee have included national educational problems and the possibility of training potential road transport engineers in electric vehicle design and operation.

The Electricity Development Committee has energetically pursued the development of electricity in its widest sense; its information and publicity services have been designed to promote a better understanding by the Press, Parliament and public of the achievement and potentialities of the electrical industry as a whole.

Upon the recommendation of the Finance Committee the minimum and maximum membership subscriptions were increased to £20 and £3,500 respectively to meet the cost of the additional services initiated during the year.

Memoranda upon various aspects of the utilization of fuel and power, containing a wealth of information, were made available to the members through the Fuel Efficiency Committee whose work is closely linked with that of the B.E.A.-B.E.A.M.A.-B.E.D.A. Fact-finding Panel on the subject.

In the section covering the work of the Materials Committee it is mentioned that British steel rollers have been unable to meet all demands for deep drawing and vitreous enamelling qualities of mild steel sheets. Consequently substantial quantities have had to be imported at higher cost, although free of import duty. After representations by the Committee the exemption of imported sheet steel and plates from import duties for a further six months from 19th March was announced. Following the resumption of private trading in copper the Committee arranged for suppliers of semi-fabricated copper to accept orders at known prices if the orders were received by 4 p.m. following the official midday quotation. Insulation materials generally are said to be now in good supply.

There was a net increase of three in the membership, raising the total to 390. The Membership Committee reports the formation of a new Electrode Boiler Section.

During the year there was a variation in the reference to the Monopolies Commission in respect of electrical and allied machinery and plant. In this connection the report says that the effort required to provide and collect the information for the Commission is a great strain on the industry. "It is particularly heavy when maximum efforts are being exerted by the industry to meet growing demands in the home and export markets." With regard to the general inquiry under Section 15 of the Monopolies Act, the chairman of the Council has pointed out the danger of disclosing detailed statistics of an industry which would assist overseas competitors.

The work of the Publicity, Research, Standardization, Taxation and Traffic Committees is briefly surveyed.

The next part of the report deals with the work of 27 Sections. Among the points touched upon are the high price of core wire for welding electrodes; the development of the commercial catering load; the improvement in the demand for domestic cookers and difficulties raised by shortage of suitable steel; the handicaps suffered by exporters of domestic appliances by reason of local manufacture; the steady progress of the electric furnace in industrial heating processes and of electrode boilers in industry; the increasing use of h.f. induction and dielectric heating in specialized industrial processes; the "appreciable demand" for British high-speed totally-enclosed reciprocating steam engines; the production of 100 MW turbo-generators and the standardization of steam conditions for 30, 60 and 100 MW sets; and the production of 100,000 h.p. water turbines.

In the fifth section of the report the work of the 26 Technical Committees is reviewed, most of it being upon the preparation of standard specifications. A list is given of the new and revised British Standards published during the year in the preparation of which B.E.A.M.A. collaborated.

ANNUAL MEETING

Sir George Bailey, C.B.E., chairman of Associated Electrical Industries, Ltd., and of the Metropolitan-Vickers Electrical Co., Ltd., was elected president of the B.E.A.M.A. for the ensuing year at the annual general meeting on 22nd April. Mr. D. D. Walker, chairman and joint managing director, Evershed & Vignoles, Ltd., was re-elected chairman of the Council, and Mr. E. H. Ball, managing director, British Thomson-Houston Co., Ltd., was re-elected vice-chairman.

In his speech, the chairman, Mr. Walker, paid tribute to the efforts made by the B.E.A. to keep pace with the increasing demands for electricity. The unfettered use of electricity, like the making of profits, had been in danger of going out of fashion, but both were indispensable to progress. American industry had far more electrical power at its disposal than industry in Britain.

The electrical industry retained its position as the second

largest exporting industry in the country, he reported. Although the value of its exports fell slightly in 1953, there were signs of recovery, and in several sections of the industry, notably domestic appliances, there had been subsequent improvement. Prices were now of paramount importance in overseas trade, and the industry had to face the problem of granting long-term credits. With particular interest, therefore, British firms awaited the outcome of proposals by the Chancellor of the Exchequer to extend the activities of the Export Credits Guarantee Department. It would help the industry's export trade further, he said, if the Chancellor would consider the harmful effects of purchase tax on export business.

Mr. Walker pointed out that the coal supplies of the world were slowly running out, and nuclear energy would probably replace coal in a number of power stations in the not far distant future. He said:—" At the moment that is as far as we can see, but what of the possibilities of the direct transference of nuclear energy into electricity? No doubt much theoretical work is being done in this direction, but with the present aura of secrecy surrounding the subject, we laymen cannot tell how far fantasy has progressed along the road to fact. And this leads me to hope that, subject to the essential demands of security, facilities will be made available for the dissemination of knowledge on as wide a basis as possible. Certain sections of our industry and certain individual firms have done great work in solving specific problems put to them and providing the appropriate equipment. But how much greater progress can be made when the problems are common knowledge and the inventive genius of our whole industry is given free play. It is encouraging to hear that training facilities are to be provided in the near future on a selective basis, but if we are to hold our own in the engineering world of the future we must sow the seed widely so that it will grow abundantly."

Aluminium-Sheathed Cables

In a paper presented on 28th April before the Supply Section of the Institution of Electrical Engineers Messrs. P. M. Hollingsworth (formerly with Johnson & Phillips) and P. A. Raine (Johnson & Phillips) reviewed the development and assessed the value of aluminium as sheathing material against a background of test performance and operational experience.

Its first commercially successful application for this purpose, the authors stated, was evolved in England in 1947 by the organization with which they were associated, since when several thousands of miles of such cables had been put into service, almost all employing the original " tube-sinking " process, in which the tube diameter was reduced by drawing without controlling thickness. Progress had been due as much to the physical advantages of aluminium over lead as to a more favourable economic comparison. Moreover if all cable sheaths made in Britain were replaced by aluminium, only 20,000 tons per annum would be required—hardly one-tenth of the country's present consumption.

A minimum composition of 99·5 per cent aluminium (B.S. 1471 : 1949) was universally acceptable. Aluminium had the same face-centred cubic structure as copper and lead—a crystal lattice which imparted ductility and ease of cold working. Resistance to corrosion depended upon the continuity of a surface oxide film. The use of unprotected sheaths for installations in air, both indoors and outside, had proved satisfactory, but in marine or contaminated industrial atmospheres severe corrosion (due to hygroscopic chlorides deposited) occurred at crevices, which became anodic areas.

The degree of atmospheric attack in damp conditions was directly proportional to the amount of soot and electrolyte deposited on the metal. When aluminium was embedded in plasters, corrosion was usually less than in cement, but surface contact with walls not painted or moisture-proofed or with any water-absorbent material was liable to cause trouble.

Variations in electrolytic composition along a route and factors creating local zones of oxygen deficiency setting up active cells in even normal soil waters prohibited the use of bare aluminium. The one known common factor essential for attack was access of moisture to the sheath, so that an impervious layer of chemically inert material was necessary to eliminate corrosion.

To make a soft-soldered joint the refractory surface must first be replaced by a less oxidizable metal than aluminium by such methods as abrasion, the use of active fluxes or ultrasonic vibration of molten solder; the alloys usually applied contained zinc or cadmium (which increased resistance to corrosion) and a high proportion of tin. The choice of alloys was restricted by the temperature limits of the insulation and the authors had adopted abrasion tinning of the sheath with the new eutectic alloy containing 90 per cent tin and 10 per cent zinc (melting range 195–198 deg C).

A major problem in the extrusion of aluminium direct on to the cable core was the necessity of employing lower temperatures and consequently higher pressures than those required for the extrusion of the tube alone so as to avoid overheating the insulation. In addition the press must produce long continuous lengths of large-diameter tube from successive charges without risk of air or oxide inclusions at billet joins.

After mentioning alternative methods, successful and otherwise, the authors gave details of the evolution of the tube-sinking process, in which the following four operations could be combined in various ways: the laying out of the tube (200 yd minimum) in a straight line; the introduction of a tow rope for threading the core; the threading of the core; the sinking of the tube into the core.

Conventional horizontal straight-through presses were used to produce tube for cable. Extrusion was invariably from solid billets. The sinking operation imposed cold plastic deformation on the tube by forcing it through a fixed die with an aperture appreciably smaller than the tube diameter and the cold working to which the metal was subjected resulted in hardness without embrittlement. Particulars were given of the numerous considerations to be taken into account during manufacture.

The replacement of lead by aluminium sheaths did not modify heat flow conditions within the cable and did not significantly affect sheath-emissivity constants. Sheath losses, however, were heavier owing to the higher conductivity of aluminium and became important for large single-core cables. Rating factors had been calculated (see *Electrical Review*, 19th February).

In conclusion a large amount of information on installation and operating experience of various kinds was given.

High Voltage Testing

Improved Facilities at the N.P.L.

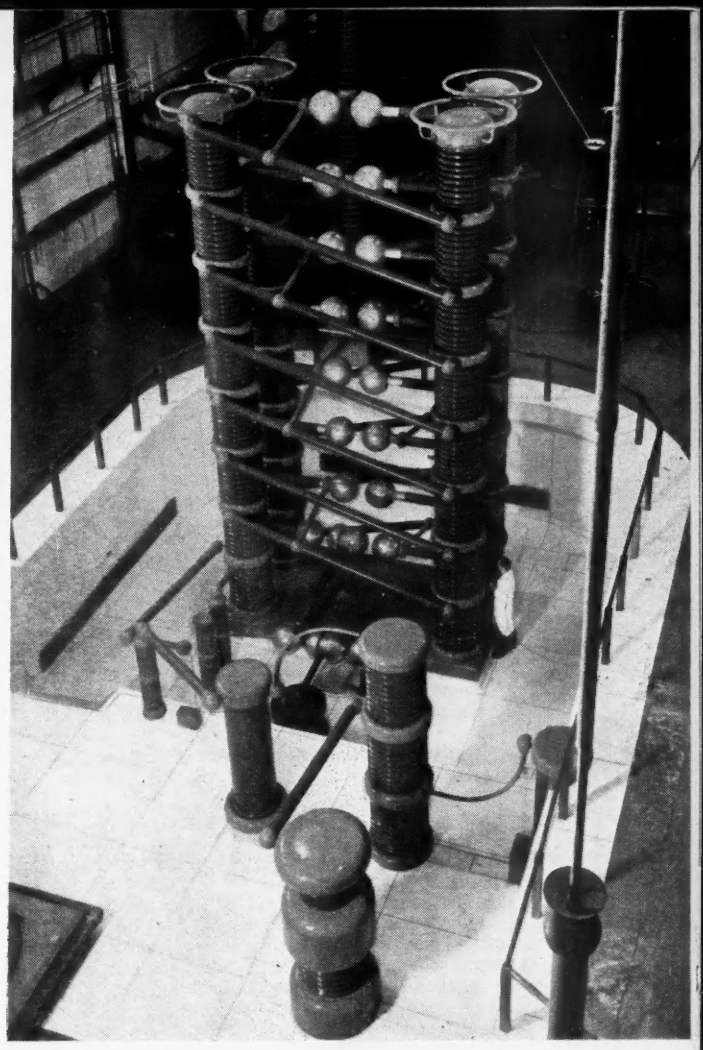
A NEW surge generator which has been installed recently at the National Physical Laboratory, Teddington, is believed to be the largest in the country. It will enable the laboratory to be of even greater service to industry by providing improved testing facilities and by pressing its technological investigations to higher voltages.

High voltage equipment, such as generators, transformers, cables, etc., has always been subjected to over-voltage tests, to prove that it has a margin of safety. At first these voltage tests were made with ordinary 50 c/s voltages, but in time it came to be realized that serious power-frequency over-voltages were not common in practice, and that breakdowns from this cause were rare. On the other hand, when lightning strikes an overhead line, which it is naturally very liable to do, or switching surges occur, the only effective limit to the transient voltage applied to the line and the connected apparatus is the existence of some electrically weak point, naturally occurring or deliberately introduced. It was soon realized that it was necessary to test apparatus with voltages of the type produced by lightning; that is, with surges of single polarity rising to their full value in something of the order of a microsecond, and falling to half value in perhaps 50 μsec. Such voltages can be produced by the well-known Marx circuit, in which a number of capacitors are charged in parallel through high resistances from a d.c. source, and are then automatically connected in series by the breakdown of air-gaps set to appropriate values.

The N.P.L. has had apparatus of this type for many years, the open-circuit voltage being 2 MV and the total energy stored in the generator being 20 kWsec. This apparatus, which was built by the laboratory staff, has served its purpose well. Recently, however, it was evident that it was becoming inadequate, partly because transmission voltages were rising, 380 kV is in use on the Continent, and partly because some of the components were showing signs of deterioration after so many years of hard service. Also it was, of course, desired to embody the experience gained in apparatus more convenient in use and better adapted to the present and future needs of the laboratory.

To meet these requirements it was decided to install a new surge generator of a size limited only by the available laboratory space. This generator has an open-circuit voltage of 3·2 MV, and its stored energy is 77 kWsec, values that should be adequate for some time to come. The Ministry of Works carried out the whole project, including the civil engineering work and auxiliary services. They worked in close co-operation with Ferranti, Ltd., who were awarded the contract for the equipment, and, with the staff of N.P.L., whose special experience has been embodied in the design and development of this generator. The capacitors were supplied by British Insulated Callender's Cables, Ltd.

The new generator is an eight-stage device, with a maximum stage voltage of 400 kV, this being provided by a transformer and voltage regulator, with a metal rectifier in a voltage doubler circuit. This equipment can produce the 400 kV required with an adequate margin and with either positive or negative polarity. Each stage consists

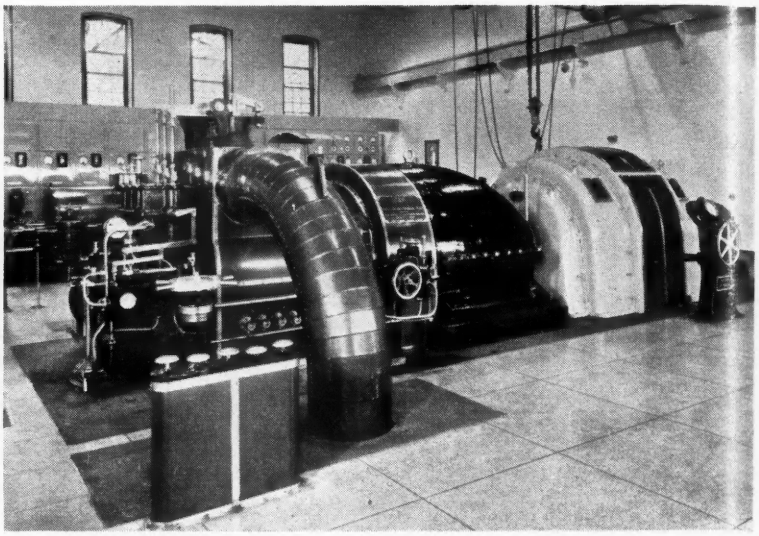


The new 3·2 MV surge generator at Teddington

of two capacitors in separate porcelain housings, the total stage capacitance being 0·12 μF. The eight stages are assembled into a four-column structure, the capacitors of each column being spaced by porcelains similar to those which house the units themselves. The generator is provided with internal charging, discharge and damping resistors, while other resistors for discharge and damping are mounted externally. The inter-stage spark-gaps have as electrodes spheres 50 cm in diameter, and the gap spacing is controlled from and indicated at the operating desk. An external bank of capacitors constitutes a permanent capacitance load on the generator, and is the section of a capacitance voltage divider for the measurement and recording of the generated surges. Provision is made for controlled electrical firing of the generator once it has been charged to the correct voltage, and for tripping high-speed cathode ray oscillographs before the generator itself is discharged, to give adequate time delays without the use of a long delay cable.

All the controls for the generator are taken to a desk situated in a glass-fronted chamber built out into the main laboratory at the level of the first floor of the building. The controls include facilities for reversing polarity, earthing the equipment, varying the charging voltage and firing the generator to deliver a voltage of predetermined amplitude and polarity. To make the most efficient use of the available space it was necessary to mount the base of the generator at a depth of about 8ft below normal floor level. The minimum clearance to earth from the output end of the generator is 21ft.

Power for Paper Making



The G.E.C. 3,500 kW turbo-alternator at Carrongrove Paper Mill seen from the steam inlet side

A NEW turbo-alternator set has been supplied recently by the General Electric Co., Ltd., for the Carrongrove Paper Mill near Denny, Stirlingshire. The set consists of a passout condensing type turbine, running at 3,000 r.p.m., direct-coupled to a 3,500 kW alternator and exciter, and designed for a maximum passout quantity of steam of 90,000 lb/hr at 50 lb/sq in. The capacity of the low-pressure end of the turbine and the condenser is such that up to 2,450 kW can be generated with no passout steam extraction.

The present operating conditions for the plant have been determined by the existing boilers, but provision has been made in the design of the turbine for conversion to higher steam pressure and temperature conditions at the inlet stop valve when it becomes necessary to consider replacement of the present boilers.

Throttle governing is used from no load to full load, the four throttle valves being operated by a relay oil system. The machine is fitted with the usual overspeed trip gear and, as an additional safeguard against damage from heavy electrical faults, solenoids on this gear and also on the condenser vacuum breaker are connected to the electrical protective system in such a way that they operate on the occurrence of a heavy fault and bring the machine to rest as quickly as possible.

The direct-coupled alternator is a three-phase, 50 c/s, 440 V machine rated at 3,500 kW, with a power factor of 0·8 lagging (4,375 kVA). Cooling is by closed air circuit, ventilating fans being mounted on the rotor. The alternator is solidly connected through copper bar to the busbars of a high rupturing capacity air-break switchboard.

The Hick Hargreaves surface condenser is capable of maintaining a vacuum of 28·25in when handling 34,000 lb of exhaust steam an hour, and when supplied with 3,070 gal per hour of circulating water at a temperature of 65 deg F. This performance can be obtained with 15 per cent of the installed cooling surface inoperative. The circulating water supply is obtained from the river Carron through a pipeline with the intake at a weir some distance up the river from the power house. Flow through the condenser is by gravity. The condenser is fitted with hinged end covers to give access to the tubes, which are of aluminium brass.

Duplicate 100 per cent duty vertical condensate extraction pumps are provided. The air extraction equipment is of the steam jet, two-stage type with interstage and afterstage coolers enabling the heat in the steam used to be recovered in the condensate.

Messrs. J. D. Crozier & Partners, Ltd., were the consulting engineers responsible for the installation of the new turbo-set and its associated equipment.

Lloyd's Register of Shipping

THE annual report of Lloyd's Register of Shipping states that in 1953 over 750 marine engines with an aggregate shaft horse power of 3·75 million were being constructed to the Society's classification. Plans for electrical installations in 490 ships, including 200 MW of generating plant, were approved. There was a trend towards the adoption of higher steam temperatures with an inclination to consolidate conditions at 850 to 950 deg F while operating experience is being obtained. Cargo refrigeration plants being built under the Society's inspection amounted to 4·6 million cu ft in 54 ships in United Kingdom yards and in 50 ships elsewhere. A new Shaw Savill passenger ship is being equipped with refrigerating machinery to provide heating as well as normal cooling.

Non-marine work to be carried out under the Society's supervision includes two identical atomic energy electric power stations, which are scheduled for completion in three years' time, and a further 60 MW of plant, doubling the capacity of the Catalagzi power station in Turkey. The major items of plant for the new Turkish 89 MW hydro-electric station at Sariyar were completed in 1953 under the Society's inspection.

Among several transmission line overseas projects inspected (towers and high voltage insulators) were schemes in Australia, Tasmania, Turkey and a 345 kV line for British Columbia. Installations for the Snowy Mountains scheme in Australia, which will take at least 25 years to complete, are also being supervised. Inspection during construction at makers' works of plant for oil refineries and oil fields forms the major proportion of non-marine work and surveyors are resident at such points abroad.

The Institution of Electrical Engineers is represented on the Society's Technical Committee by Sir George Nelson and the B.E.A.M.A. by Mr. R. G. A. Dimmick. The Society's principal electrical engineer, Mr. G. O. Watson, visited French shipbuilding yards to discuss electrical requirements for tankers being built there to Lloyd's classification.

Resistance Wire and Tape

Much useful information for all users of electrical resistance wire and tape is contained in a 33-page booklet now being distributed by the Alloy Wire Co., Ltd., Lawrence Lane, Old Hill, Staffs. The corners of the pages are in different colours and these assist in readily locating the required technical data relating to the company's materials, which are denoted by a colour conforming to the identification system used by the American Bureau of Standards and by a letter relating to the grading, B.S.S. 115 : 1938.

Safe Use of Portable Equipment

Discussion on I.E.E. Utilization Section Paper

THE discussion on the paper entitled "Safety in the Use of Portable and Transportable Electrical Equipment in Industry," which was presented by Mr. J. W. Bunting on 22nd April before the Utilization Section of the Institution of Electrical Engineers (see *Electrical Review*, 23rd April, page 742) was opened by Mr. H. W. Swann (Chilton Electric Products, Ltd.), who considered the paper timely. He thought the monitoring circuits and the schemes illustrated by the diagrams were excellent for a well run and highly organized works with skilled supervision. In engineering concerns in general, however, it was as yet early to expect such a system to be operated successfully. If maintenance engineers began by taking loop tests on ordinary earth wires and ensuring their integrity and sufficiency, that would be a considerable step in the right direction. This would lead to knowledge of the conditions which demanded special treatment.

Some authorities held that fibrillation could be arrested or treated and the state of fibrillation might be reversible, though after a long period; this was a point in favour of the rocking stretcher method of artificial respiration. With d.c. (not dealt with by the author) the degree of immunity from electric shock accidents was high. He asked how the author's monitoring circuit compared with circulating current protection in quarries, which was based on many years' experience. The Factory Department had persistently demanded an insulated type of portable hand-lamp, which was justified by experience of the past thirty years. The author's suggestion that all portable hand-lamps should work with transformers went rather far, but for working in a boiler no additional precaution could be too expensive.

Metal-Cased Transformer Hazards

Mr. S. J. Emerson (Ministry of Labour and National Service) considered the paper a magnificent effort. He agreed with the author's remarks on electric shock; but, speaking as an individual and not as a factory inspector, he differed from Mr. Swann as to fibrillation. His experience was that once it set in it proved fatal. At the high voltages of direct current there had been a long run of accidents, and there was ground for considering the reduction of d.c. voltage to even less than 110. As regards portable transformers with metal cases, one or two fatal and a good many serious non-fatal accidents had occurred with 25 V equipment energized at 240 V through a metal-cased transformer, the case having become alive. All portable transformers should be enclosed in an oak or teak case. A recent development of the Butcher system, known as the "Londex," had a control system of maintenance incorporating earth-leakage protection and low voltage, the control device being extremely good. The author's conclusions were in line with the recommendations of the Factory Department and complied with the letter of the law and the spirit of safety.

Mr. C. F. Freeman (Courtaulds) pointed out that Blumquist and his colleagues in the United States had proved in both theory and practice that on installations with insulated neutrals where the earth was arcing or intermittent the voltage on the other lines was several times higher than the normal phase voltage owing to the natural frequency of the system. He thought the decision of the Factory Department was right and based on good engineering and common sense.

Mr. J. Cowan (H.M. Principal Electrical Inspector of Mines) said that most electrical accidents in mines and quarries were due to shock, in which plugs and flexible cables played an important part. He deprecated the practice of deliberately screwing up 240 V terminals with the fingers, particularly where an apprentice was looking on. The author had not dealt with flameproof apparatus for which there was an increasing demand in industries other than mining. This changed the picture materially, for it necessitated flameproof switchgear, plugs and sockets, as well as remote control or electrical interlocking for flexible cables and, more important, the pilot circuit must be intrinsically safe.

Mr. N. C. B. Carrick (I.C.I.) suggested that 50 V centre-tapped transformation giving 25 V to earth might not be necessary in industries where conditions were fairly clean and dry as compared with the chemical industry. To reduce the voltage to 50 need not involve heavy expenditure. The author's figures were on the high side.

Specific Regulation Needed

Mr. G. E. Skillington (Unilever, Ltd.) believed that medium voltage portable equipment was still permitted in industry only because 240 V sockets were installed throughout the vast majority of factories; 240 V tools were readily available, and the cost of making the change suggested would be prohibitive. A specific regulation was called for, forbidding the use of such equipment which relied on a single earth core in a flexible cable for its protection. He outlined a procedure which would, he claimed, ensure safety under the worst operating conditions at negligible cost. No 240 V portable tools were allowed by his organization, where the use of 50 V tools had been agreed upon, nor were medium-voltage extension leads; contractors had to use the company's tools or provide their own similar tools. He pointed out that although the Engineering Equipment Users' Association had agreed to the publication of the sections dealing with earth-leakage monitoring equipment, they did not as a body support the views of a small minority of their members who favoured the installation of 110 V tools.

Mr. S. W. Eckett (Nalder Bros.) described the Nalder circulating current or earth-protection unit, which with a vibrator and transformer could work on d.c. It was available in a relay form for controlling contactor gear.

Mr. C. A. M. Thornton (I.C.I.) said that his company had installed a 50 V, 1,000 A 20-operator level-compound welding generator and had never received any complaint of shock. Fatalities had occurred, however, in connection with a 95 V a.c. welding set elsewhere. The margin between no shock and risk of fatality was narrow. There was a field for 110 V a.c. where the load was too great for 50 V—for instance with descaling tools for boilers and evaporators. In his own works, they could not dispense with 240 V sockets, because they had to fit instruments made only for that voltage, but during the past four or five years 50 V systems had been installed.

Mr. H. W. Puttick reported that on the Eastern Railway

in India he had earthed all the crane and traverser tracks. After an accident in Calcutta where six coolies had been electrocuted because of sand on the rails, which prevented the current from leaking away to earth, he found that most of the copper bonding had been dug up and stolen.

Mr. D. B. Hogg (I.C.I.) said that the electricity regulations required the cases of all apparatus to be earthed by leads connected to the general mass of the earth in such a manner as would ensure at all times the immediate discharge of electrical energy without danger. Lower voltages and fancy gadgets had to be contemplated because all portable and transportable apparatus could not be earthed within the meaning of that regulation. Long experience had convinced him that nothing higher than 25 V to earth was safe. There was no real gain in going to 110 V, which was very dangerous.

Faulty Installations—The Legal Aspect

By F. E. SUGDEN

POSSIBLY because of alterations at some time, cases occur of faulty factory installations which are dangerous not only to the occupier or owner of the premises but to any person who enters the premises. An electrical accident on such premises may result in heavy damages being claimed against the persons responsible for the fault.

In a case which recently occupied the attention of the High Court both the owner of the factory concerned and the electricity supply authority were held to be liable for the faulty condition of the installation.

Briefly the facts were these: The second defendants were the authority responsible for the supply of electricity to a factory occupied by the first defendants. Recently a fire broke out at the factory and the fire brigade was summoned. As soon as they arrived a fire officer asked the first defendants' manager where the switches were so that he could cut off the electricity. He was directed to a main switchboard on the ground floor and, in his presence, another fireman pulled two ironclad switches, contained in boxes adjoining the switchboard, which were obviously main switches. They all thought that the whole supply of electricity to the premises was then cut off as the manager did not know and the firemen did not realize that the lighting circuit was controlled by two old-fashioned tumbler switches situated near the main switchboard and unconnected by any form of link-bar. Notwithstanding that these tumbler switches were not turned off no current should have been flowing through the lighting wires on the upper floor of the premises where the fire was blazing, as the master switch which controlled the lighting circuit on the upper floor was turned off. But the polarity of the lighting system had been reversed by the crossing of the two leads between the tumbler switches and the meter and neutral bar, with the result that the neutral wire was alive throughout the whole circuit.

When a fireman entered the room where the fire was, a live wire came into contact with his arm and he was killed. The accident could not have occurred if the tumbler switches had been in the "off" position or if the leads had not been crossed. When and by whom they were originally crossed was not known. However, previous to the accident the second defendants had fitted a new meter, but had not tested the circuits. The widow of the deceased man claimed damages against the owner of the factory and the electricity undertaking in respect of her husband's death, the claim against the electricity authority being based mainly on its failure to test the circuits when fitting the new meter. By their defence the authority pleaded that the accident was caused either wholly or in part by the negligence of the deceased or of some other fire officer.

The Court held, that although a fireman should understand the usual and normal methods of cutting off the electricity supply in premises in which a fire had taken place, he was not required to possess a detailed knowledge of obsolete mechanism and neither he nor any other member of the fire brigade was to blame for the accident. The Court further held that the proprietors of the factory should have been aware of the method of cutting off the supply to the lighting and power circuits, and thereby have been able to give the fireman, who was deemed to be an invitee, warning of any unusual danger of which they should have been aware. They had also failed to comply with the requirements of the Electricity (Factories Act) Special Regulations, 1908 and 1944. The second defendants, the electricity undertaking, when it installed the new meter, should have realized that the proprietors of the factory would assume that the main supply had been properly connected up and tested. The Court held that there had been a negligent omission constituting a breach of the legal duty which the authority owed to the deceased. In these circumstances the Court found that both the owners of the factory and the electricity undertaking were liable for damages.

The High Court in coming to its decision laid special stress upon the status of the deceased being that of an "invitee" which affected the legal position. A person is an invitee when he is not compelled to enter any premises and is not requested to do so by the proprietor of the premises even if it be a shop or factory where persons are permitted to enter voluntarily and are not debarred from so doing by the proprietors of the factory or owners of the shop.

As an invitee is allowed to enter the premises with the consent of the proprietor or owner of the premises, then that proprietor or owner must make sure that the invitee enters the premises in safety. If perchance the invitee is injured on entering the premises and he could not have foreseen the danger or hidden trap, as it is termed in law, then definitely the proprietor is liable for damages for any injury caused to the invitee, because he should have made sure that the premises were safe.

SOLAR GENERATION

A DEVICE which generates electricity by making use of solar energy has recently been developed by the Bell Telephone Laboratories in the United States. It comprises a thin strip of silicon and when it is exposed to sunlight about six per cent of the potential energy available in the light is converted into electricity. With further development one of these "sunshine" batteries, it is claimed, would supply sufficient power for operating long rural telephone lines. The batteries would supply power by day, even in cloudy conditions, and charge storage units for night operations.

4 MeV Linear Accelerator

Gantry-Mounted Machine at a Newcastle Hospital

THE world's first gantry-mounted linear accelerator for the super-voltage X-ray treatment of deep-seated diseases, including cancer, is now in operation in the "Megavoltage Treatment Unit" at the General Hospital, Newcastle-upon-Tyne, under the direction of Mr. C. J. L. Thurgar and Dr. F. T. Farmer, chief radiotherapist and principal physicist, respectively, of the North-Eastern Region. It has an energy rating of between 3·5 and 4 MeV and is the first of five such machines that are being developed in this country for the Ministry of Health. The other four machines will eventually be installed at the Christie Hospital, Manchester; the Radium Institute, Liverpool; the Mount Vernon Hospital, Northwood; and the Royal Infirmary, Edinburgh.

The linear accelerator at Newcastle was developed and built by the Mullard Research Laboratories, Redhill, Surrey, on behalf of the contractors to the Ministry of Health, Philips Electrical, Ltd. Installation was carried out during the summer and autumn of 1953. First treatments started during December last, while treatments on a routine basis commenced in January. So far, reactions to the treatments are as expected and the tumours are, in most instances, responding. In accordance with current medical practice, however, no assessment of the results can be made for three, and possibly up to five, years. The new machine is intended for research as well as for routine treatments. It will enable radiotherapists to devise new ways of applying high-voltage X-rays to the treatment of tumours.

The machine has three main advantages over existing deep therapy units of the 200–250 kV class. The first advantage is that the increased penetration of the X-ray beam enables tumours to be treated that are too deep to be dealt with effectively by conventional deep X-ray therapy methods. Furthermore, practically no damage to the skin results from the treatment, which can be a serious problem when using lower-voltage X-rays. More intense dose rates can be employed, thus enabling treatment times to be considerably reduced. There is, moreover, less scattering of the beam during its passage through the body.

In the design of the new machine it was necessary to make a compromise between the demands for X-rays of higher energy and intensity and the need for a practical working machine of comparatively simple construction. The 3·5–4 MeV linear accelerator was selected as being the machine most suitably meeting these requirements, because, by taking advantage of recent improvements in the design of wave-guide systems, it is now possible to reduce the length of machines of this energy to such a point that they can be conveniently mounted in a movable gantry. The machine is so designed that, whatever the position of the gantry, the X-ray beam always cuts the axis of the couch pillar at the same point. Thus, a patient lying on the couch may be quickly brought to the correct distance for treatment and only simple adjustments to the couch height and horizontal position are necessary. The couch is electrically operated from a finger-tip control on a simple control pedestal mounted on casters so that it can be moved to suit the operator's convenience. The couch top can, where necessary, be exchanged for a treatment chair.

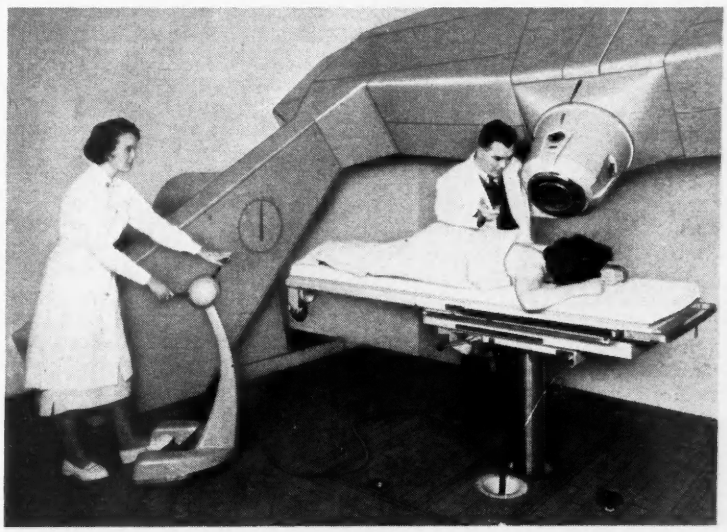
The gantry housing the linear accelerator is driven by an oil motor through a reduction gear, the power being provided through an electrically driven pump. This drive is designed to give fine variable speed control from the control pedestal.

An optical system consisting of a light and mirror is arranged so as to illuminate the exact treatment area on the patient's skin. An additional optical system operates as a range-finder, giving an accurate indication of 1 metre distance from the target. A mechanical back-and-front pointer system is also provided.

An interesting feature of super-voltage therapy machines of this kind is that during setting up and actual treatment no physical contact is made between the X-ray head and the patient, i.e. no applicator is required. The X-ray head is, in fact, always at least 1ft away.

The layout of the building includes separate treatment, control, apparatus and planning rooms. The control desk for the radiographer incorporates all the controls and instruments necessary for the treatment of patients. Dose-rate meters, a dose meter and dose-setting controls, together with a timer, are built-in features. In general, the operator's control is simple and differs little from that of a conventional therapy machine.

In the apparatus room there is a separate control desk which enables the physicist to take measurements and check the general performance of the machine. Also in this room are the modulator; a rack-unit carrying the



Close-up of the X-ray head of the linear accelerator positioned for treatment

power supplies and various control and interlocking circuits; and a backing-pump which connects to a diffusion pump on the gantry which, in turn, is connected to the accelerator through a large rotating vacuum joint. A vacuum measuring trolley is also kept in the room for checking pressures in the accelerator. This comprises a Penning, and an ionization and a Pirani gauge.

The linear accelerator operates at a pulse repetition frequency of 400 p.p.s. and a mean beam current of 150 μA. Under these conditions the X-ray output is approximately 250 r/min at a distance of 1 metre without filtration. Higher outputs are possible for shorter periods, the limitation on the amount of increase and duration being governed principally by the magnetron. The overall energy consumption from the mains is of the order of 15 kW.

Reports on Current Research

New Publications of the E.R.A.

IT has been known for some time that lightning faults on high voltage transmission lines of, say, 66 kV and above are caused exclusively by direct strokes to a phase conductor or to an overhead earth wire or tower with subsequent back-flashover. It is also generally considered that distribution lines of 33 kV or below may sustain lightning faults as a result of a direct stroke or of an indirect lightning surge produced by a stroke which does not strike the line or which strikes an earthed part of the line without causing a back-flashover. However, the problem of the relative importance of direct and indirect lightning surges has not so far been solved.

There is, basically, no reason to assume that direct and indirect lightning surges affect an overhead line in the same manner. Again, it cannot be expected that a given protective device is equally effective against both types of surge. It is for these reasons that a knowledge of the frequency of occurrence of direct and indirect surges is important to the distribution engineer.

To contribute to the solution of the above problem the E.R.A. has recently published Report Ref. S/T75, "Indirect Lightning Surges on Overhead Distribution Lines," by R. H. Golde, Ph.D., M.I.E.E. (British Electrical and Allied Industries Research Association, Thorncroft Manor, Dorking Road, Leatherhead, price 30s), which examines the amplitudes and waveshapes of indirect surges and the frequency of occurrence of direct and indirect surges on lines of different types of construction.

Another new E.R.A. publication, Report Ref. Z/T91, "Self-Adjusting Welding Arcs," by J. C. Needham, B.Sc. (Eng.) (price 10s 6d), deals with a preliminary examination of the mechanism of arc length control of the "self-adjusting" arc and particularly with the effects of the output characteristics of the welding power source on the degree of self-adjustment of arc length. The sources compared are a commercial d.c. welding generator, a low voltage d.c. battery with series resistance, and a low voltage a.c. transformer with series reactance. The effects of changing the wire feed rate, the current setting and the open-circuit voltage are considered in relation to the degree of self-adjustment.

The self-adjustment of the arc length due to the power circuit characteristics increases rapidly and is very pronounced as the open-circuit voltage approaches the arc voltage. At low open-circuit voltages on d.c. the arc current is scarcely predetermined but immediately rises until it burns off the electrode at the required rate. The arc is stable and the arc length is substantially independent of the wire feed rate over a comparatively wide range but is controlled by the open-circuit voltage and series impedance.

With an auxiliary source for cyclic arc re-ignition the arc can be run on a.c. at low r.m.s. open-circuit voltages. Although the degree of self-adjustment is less on a.c. than on d.c. it is still satisfactory.

The use of a single conductor cable of the proposed a.c. cross Channel link between Great Britain and France has been contemplated for a trial d.c. transmission with sea return. The magnetic field due to the direct current in the cable would lead to errors in magnetic compasses of ships near the cable crossing. In Report Ref. B/T116, "The Magnetic Compass Error Caused by d.c. Single-core Sea Cables," by F. Busemann, Dr.-Ing. (price 10s 6d), the magnitude of the fields and of the error has been calculated.

In Report Ref. G/T287, "Heavy Duty Contactor Contacts. Present Knowledge and Need for Research," by A. W. Baxter, B.Sc., M.I.E.E. (price 10s 6d), the present position is reviewed and it is concluded that comparatively little is known about heavy-duty contacts. The fundamental theory underlying contact wear is not yet fully established and there is a need for basic data on which sound design can be based. The E.R.A. is therefore equipping a special laboratory where continuous 3-phase power up to 600 A at 440 V and much larger short-period powers will be available.

In Report Ref. S/T72, "The Effect of an Open-Circuited Section on the Distribution of Surge Voltage in a Continuous-Disk Transformer Winding," by E. L. White, B.Sc. (Eng.) and T. J. Brown, B.Sc. (price 18s), a description is given of tests carried out on a continuous disk type of winding with uniform insulation. The sections open-circuited contained up to 25 per cent of the turns and were symmetrically disposed about a break at the mid-point. Oscillograms of voltages to earth and between tappings in the open-circuited disks were recorded with the recurrent-surge oscillograph. As compared with the full winding, voltages to earth were not materially different, though voltages between tappings tended to be lower. The voltage across the break was found to reach 35 per cent of the applied voltage, where only 7 per cent of the turns were open-circuited.

Nearly 100 oscillograms of voltages between selected tappings were analysed into component frequencies by inspection. A few were also analysed by a mathematical method, which is outlined in an appendix. As the number of open-circuited disks was increased from zero, the fundamental and odd harmonics were unchanged, as anticipated from theoretical considerations, but the even harmonics were replaced by an equal number of new modes of oscillation, the frequencies of which varied considerably. These variations are discussed. A few tests made with tapping risers connected to the winding showed a slight improvement in the surge voltage distribution.

Loch Shin Contracts

THE North of Scotland Hydro-Electric Board has placed the first of the main contracts for its Loch Shin hydro-electric scheme (constructional scheme No. 32). George Wimpey & Co., Ltd., Edinburgh, have been awarded the contracts to build the Shin generating station and tunnel and Lairg dam. The tunnel will be five miles in length. Lairg dam will be 38ft high and 1,370ft long. R. J. McLeod (Contractors), Ltd., Glasgow, have been given the contract to construct the Cassley generating station on the south shore of Loch Shin near Creanich, aqueducts which will collect water from the headwaters of the River Cassley and a 2½ miles long tunnel which will lead it to the power station. The value of the contracts is approximately £5,000,000.

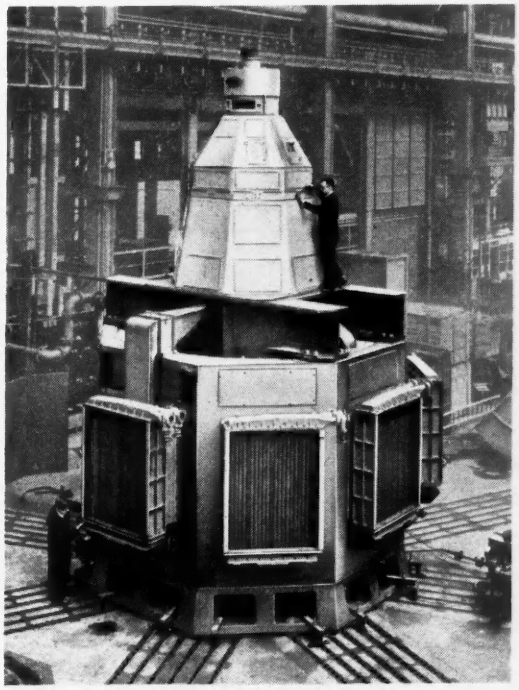
The Shin scheme, designed to harness the water power resources of an area extending to some 250 sq miles, includes the waters of Loch Shin and its tributaries, the River Cassley and the headwaters of the rivers Vegastie and Brora and other streams in the County of Sutherland. The annual production of electricity will be in the region of 154 million kWh.

Plant for Errochty Station

The accompanying photograph shows a vertical shaft water-wheel alternator for the Errochty power station of the North of Scotland Hydro-Electric Board on the test bed at the Witton Engineering Works of the General Electric Co., Ltd. The machine has an output of 25 MW at 11 kV and is the second of three alternators of this rating to be built by the G.E.C. for the Errochty station. The alternators are to be driven at 428 r.p.m. by Boving water turbines and the first set will be ready for commissioning in a few weeks.

Lines Across Estate

Because two 66 kV feeders which cross the Leam Lane, Felling, estate made development difficult the Felling Council asked the North Eastern Electricity Board whether the route of the lines could be altered. The Electricity Board replied that if the Council could not adjust its housing layout the Board would divert the lines subject to the cost being borne by the developing authority. The cost of placing the lines underground would be between £55,000 and £60,000 but an overhead diversion scheme would cost £18,000. The Council has approved the proposed overhead diversion in principle.



A 25 MW water-wheel alternator for Errochty power station on the test bed at Witton

Electricity Boards' Sales

Details of electricity output in March were given in last week's issue (page 753). The accompanying table analyses the sales of Electricity Boards during the month. The national figures show an increase over March, 1953, of 10·6 per cent, but when corrected for weather and the number of effective working days the increase is 8·9 per cent. The weather conditions were slightly colder than a year earlier but there were more working days.

ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for March (million kWh			Twelve Months Totals Ended 31st March (million kWh)		
	1953	1954	Inc. or Dec. %	1953	1954	Inc. or Dec. %
London	553·3	582·6	+ 5·3	5,541·8	5,723·9	+ 3·3
South Eastern	313·2	334·6	+ 6·8	3,201·9	3,410·3	+ 6·5
Southern	364·0	393·7	+ 8·2	3,740·1	4,003·5	+ 7·0
South Western	174·6	199·8	+ 14·4	1,798·6	1,962·9	+ 9·1
Eastern	504·8	543·5	+ 7·7	5,206·3	5,537·8	+ 6·4
East Midlands*	428·1	461·1	+ 7·7	4,448·5	4,717·7	+ 6·1
Midlands*	567·8	636·0	+ 12·0	6,001·6	6,347·6	+ 5·8
South Wales*	300·0	347·9	+ 16·0	3,308·0	3,601·2	+ 8·9
Merseyside and North Wales*	307·6	345·5	+ 12·4	3,348·6	3,569·0	+ 6·6
Yorkshire*	544·9	611·4	+ 12·2	5,827·9	6,185·8	+ 6·1
North Eastern*	318·6	356·4	+ 11·9	3,496·2	3,713·1	+ 6·2
North Western*	602·9	679·5	+ 12·7	6,368·6	6,932·1	+ 8·8
South East Scotland ...	115·4	134·9	+ 16·9	1,236·0	1,340·1	+ 8·4
South West Scotland* ...	284·1	314·4	+ 10·7	2,990·7	3,191·2	+ 6·7
Total all Area Boards ...	5,379·3	5,941·3	+ 10·4	56,514·8	60,236·2	+ 6·6
Direct Supplies by Central Authority	77·3	95·8	+ 23·9	764·6	1,016·3	+ 32·9
Grand Total	5,456·6	6,037·1	+ 10·6	57,279·4	61,252·5	+ 6·9
Mainly Industrial Areas* ...	3,354·0	3,752·2	+ 11·9	35,790·1	38,257·7	+ 6·9
Mainly Non-Industrial Areas	2,025·3	2,189·1	+ 8·1	20,724·7	21,978·5	+ 6·1
Total Number of Effective Working Days	28·53	28·86		330·98	330·79	

*Over half of the total sales in the preceding financial year were to industrial consumers.

Street Lighting Conversion

Prestwich Council is seeking Ministry approval of a scheme for converting all street lighting from gas to electricity at a cost of £23,000.

Salisbury Housing Policy

After a proposal to refer the matter back had been rejected and an amendment defeated, Salisbury City Council at its last meeting decided to discontinue the practice of providing cookers and wash-boilers in Council houses. Both electricity and gas services are to be installed to enable the tenants to choose which they prefer. On changes of tenancy the existing cookers and wash-boilers are to be offered to the new tenants without payment. Tenants are to be informed that the Council does not repair cookers and wash-boilers and tenants will have to provide their own replacements.

The decisions were made on the recommendation of the city treasurer. He reported that the Southern Electricity Board required a contribution towards the cost of service lines where the Board had no monopoly of supply or where freedom of choice as to the

methods employed was not available to the tenants. In the case of the Council's Primrose and London Road estates it was estimated that contributions of £300 and £3,500, respectively, would be required. The recommendations were also made to overcome difficulties experienced by the Council in asking tenants to be responsible for maintaining electrical appliances in good condition.

Plant Capacity in North East

Addressing members of the North Eastern Electricity Consultative Council at Newcastle-on-Tyne, Sir Henry Self, deputy-chairman (administration) of the B.E.A., said that during the past six years additional generating plant with a capacity of 340 MW had been installed in the North Eastern area. This represented about one-third of the plant now installed in the area. Plans for the future included the provision of another 900 MW in the next few years. The greater concentration of generating capacity on sites where coal was cheap had resulted in appreciable economies and the effect of this would be increased by the development of the supergrid system.

Sir Henry stated that 11s 1d out of every £ of the B.E.A.'s income in 1952–53 was spent on fuel. The next biggest items of expenditure were depreciation and interest amounting to 3s 10d, while salaries, wages, national insurance, superannuation and so on took a further 2s 6d. Increases in fuel costs were to blame for the rise in bulk supply charges since vesting date.

Dust Complaint

Newcastle-on-Tyne City Council is to meet representatives of the Ministry of Fuel and Power to discuss the amount of dust falling on the west end of the city from, it is alleged, the Dunston power station. The B.E.A., however, contends that the dust eliminating plant at Dunston is almost 100 per cent effective. The City Council recently threatened legal proceedings against the B.E.A. on the subject.

Installation Plans

Newcastle-on-Tyne City Council has received sanction to borrow £24,116 for installing electricity in more than 900 Council houses and £20,759 for the provision of additional equipment in the engineering and electrical engineering departments at the new Rutherford College.

Electricity is to be installed in all pre-war Council houses at Reading which are not already served. The total capital cost is estimated at £53,800.

Report on House Wiring

St. Helens Housing Committee has instructed the building manager to prepare a report on the wiring in pre-war houses. The manager informed the Committee that the tenants had made a lot of additions and the work in many cases had been done by amateurs so that there was a danger to life and a fire threat to the property.

OVERSEAS

Trinidad Transfer

Agreement has been reached for the purchase of the San Fernando Borough Council's diesel generating station by the Trinidad and Tobago Electricity Commission, and arrangements have been made for the transfer to take place on 1st May. The San Fernando station first generated electricity on 15th December, 1923, since when a number of extensions to the station have been made. The Borough Council has, however, now found it more economical to obtain its electricity from the Commission. Mr. K. W. Finch, general manager of the Commission, tells us that the San Fernando diesel plant is to be maintained as a stand-by peak load station for a few years.

Italian Power Production

In 1953 the increase in Italian output of electrical energy continued, although handicapped by the water situation which was particularly unfavourable during the first nine months of the year, forcing the power companies to rely more extensively on their thermal stations, even in summer. For the first nine months of the year the statistics of the "large output" group (comprising about 97·5 per cent of the national output) showed a total production of 23,423 million kWh, a 4·5 per cent increase in comparison with the corresponding period of 1952.

In 1952 the total output of electricity reached the record figure of 30,843 million kWh. This represented an increase of 5·54 per cent compared with 1951 and 98·42 per cent in comparison with 1938.

The building of new stations was continued in 1953. During the preceding year new hydro-electric plant of an aggregate of 467,591 kW was installed together with thermal plant totalling 451,941 kW. In the first nine months of 1953 the hydro-electric and thermal plant installed had capacities of 427,710 kW and 423,000 kW respectively. Large thermal stations were started up in Chivasso, Genoa, Tavazzano, Piacenza, Marghera, Civitavecchia, Naples and Palermo. This work has been carried out under a programme drawn up by the companies in 1949 and financed by E.R.P. loans for purchasing part of the machinery and materials in America.

This activity has practically completed the realization of the 1949 five-year plan, but, apart from this, numerous other schemes have been carried out by the commercial electricity supply companies.

Connections with foreign countries to facilitate the exchanges of energy in a general European collaboration have been increased in number during recent years. At the present time Italy is connected by means of e.h.v. lines with France (five lines), Switzerland (seven), Austria (two) and Yugoslavia (six), while others are being erected or are projected.

Aluminium-Sheathed Oil-Filled Cables

British Insulated Callender's Cables, Ltd., which in 1951 supplied and installed the world's first 33 kV aluminium-sheathed impregnated pressure cables, has now received an order from the British Electricity Authority for the first 132 kV aluminium-sheathed oil-filled cables to be installed in this country. The cables, which are of single-core construction, are part of a contract awarded to B.I.C.C. for the supply and installation of both lead-sheathed and aluminium-sheathed 132 kV oil-filled cables in the 275 kV substation at Elstree, Hertfordshire.

The contract will provide a unique opportunity for comparing, under identical working conditions, the characteristics of this cable with the conventional lead-sheathed oil-filled cable of the same voltage.

The aluminium-sheathed installation will include three straight joints which, although of standard electrical design, will involve the application of plumbing techniques developed from experience gained in jointing lower voltage aluminium-sheathed cables.

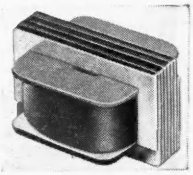
The cable consists of an 8 mm oil duct round which is formed the conductor, consisting of 57/·102in plain copper wires, giving a sectional area to the conductor of 0·45 sq in. Over the paper insulation is a metallic screen and a copper woven fabric tape. The aluminium sheath is 0·11in thick and, when swaged down, gives the cable a diameter of 2·35in. The protection consists of layers of p.v.c., rubber and hessian tapes. The overall diameter of the cable is 2·81in and the weight is 16·8 lb/yd. The lead-sheathed cable has an identical conductor size but an overall diameter of 2·59in and weighs 23·7 lb/yd. The bending radius is similar for both cables. The aluminium-sheathed cable is designed to operate at a maximum stress at the conductor of 85 kV/cm.

The installation will be carried out this year by British Insulated Callender's Construction Co., Ltd., and will involve laying the cables direct in the ground and terminating them in outdoor type sealing ends.

NEW ELECTRICAL EQUIPMENT

Small Special Transformers

As a result of the availability of junction type transistors John Bell & Croyden, 117, High Street, Oxford, have marketed the "Belclere F" transformer which was designed with the idea of producing the smallest



The "Belclere F" transformer

possible equipment consistent with the highest performance. The unit measures $\frac{1}{2}$in by $\frac{5}{16}$in by $\frac{3}{8}$in and is available in the following three models: FM-5V-41 is for interstage coupling junction transistors; it has an inductance of 10 henries at 0·4 mA and its ratio is 5 to 1; FM-50V-42 serves for the pentode to junction transistor coupling; it has an inductance of 50 henries at the maximum current of 50 microamps and its ratio is 50 to 1; FM-10V-01 is for the crystal microphone input to junction transistors; it has an inductance of 60 henries at no d.c. and the ratio is 10 to 1. In the case of a parallel fed unit for a crystal microphone coupling the inductance is 25 henries.

Two-pint Kettle

A 2-pint polished aluminium kettle is being placed on the market by Metway Electrical Industries, Ltd., King Street, Brighton, 1, at a selling

Metway two-pint kettle

price of £1 14s 9d. It has a 750 W immersion type element and is supplied in individual cartons complete with connector and flex.

Mercury Sign Tube Electrode

Tests have shown that a new electrode developed by Claude-General Neon Lights, Ltd., Pitman House, Parker Street, W.C.2, successfully prevents end-dulling during the working life of a mercury sign tube and signs stay uniformly bright even in bitter weather.

The mercury vapour comes from liquid mercury in the casing of the electrode. Until the new electrode was introduced the amount of metallic mercury it was possible to use in mercury fluorescent tubes was limited. In cold weather the mercury was driven from the hot electrodes to condense in the middle of the comparatively cool tube; when the liquid mercury supply at the electrodes was exhausted fluorescence at the ends became almost nil. It was not possible with old-type electrodes to increase the mercury reserve available for vaporization since there was no way of keeping it in the electrodes. Movement of the tubes would have allowed metallic mercury to run down the tube with the risk of stripping the fluorescent coating. A mechanical barrier overcomes this trouble in the new electrodes. They can house a bigger quantity of mercury than before—enough to replace any which may be lost by condensation.

Diagnostic X-Ray Apparatus

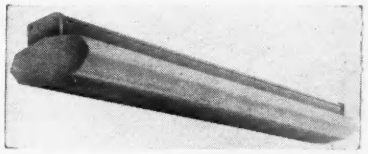
A self-contained X-ray apparatus called the "Cardanoscope" has recently been introduced by Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2. Intended, primarily, for examination of the chest, it embodies a method of suspending the X-ray source which ensures rapid and effortless operation. The main structure of the stand is simple and can be readily demounted for transportation.

The fluorescent screen assembly (16in by 16in) is balanced, and once adjusted need not be moved again, even when making detailed examination of such parts of the chest as the apices or the costo-phrenic angles. This is because the X-ray tube head is suspended in what is virtually a gimbal mounting and is capable of rotation in two planes at right angles to each other. Control of the movement of the X-ray beam is effected by means of an extension arm. Movement of this arm —which is finger light in operation—upwards, downwards or sideways, is faithfully reproduced by the X-ray beam. The unit can be operated with tube voltages from 40 to 85 kV, whilst the tube current for radiography can be selected at either 10 or 15 mA. For fluoroscopy the current is 3 mA.

The control desk is compact and can be supplied with a mobile stand. In the control unit is an inverse voltage suppressor which ensures a full 85 kVp in the forward direction, without any undue stress on the insulation and which also reduces the current consumption of the apparatus. The "Cardanoscope" can be operated on any mains supply from 95 to 250 V, 50 or 60 c/s.

Fluorescent Diffuser Fitting

A new "Mazda" commercial enclosed type 5ft single or twin-lamp fluorescent fitting has been added to the range of fluorescent fittings manu-

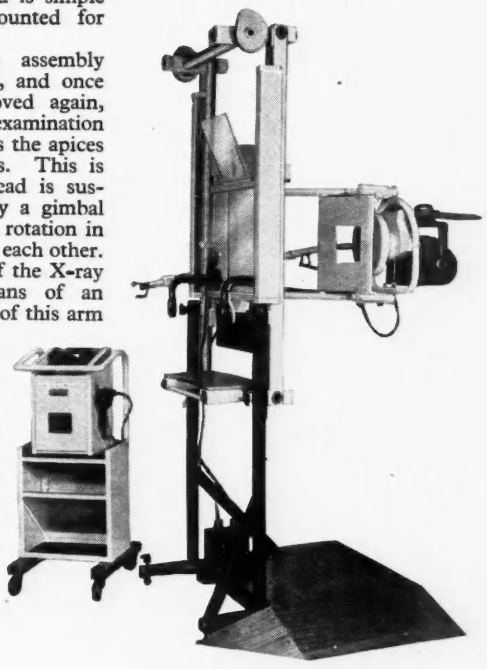


"Mazda" fluorescent diffuser fitting

factured by the British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2. A smooth one-piece "Perspex" diffuser cover allows all-round light distribution, including both ends of the fitting. It incorporates the B.T.H. "Pendicone" rapid installation system and fixed b.c. lampholders which permit relamping with either hand from either end. The cover will hinge from either side of the gear channel to give access to the lamps and can be completely removed without undoing any screws.

Fittings are available ready wired for switch start or instant start circuits. Lamp control gear is of the B.T.H. "brick" type and "Permitol" capacitors are used.

Philips "Cardanoscope"



Financial Section

STOCKS and SHARES

THE accompanying share lists cover on this occasion a period of three weeks. The column of price changes consequently gives an impressive idea of the extent to which markets went ahead during the greater part of April, despite a negative Budget, the intervention of the holiday and a good deal of selling induced by the pace of the advance. A display of strength by the gilt-edged market, connected apparently with persistent talk of another Bank Rate reduction, contributed to further record-breaking achievements in the industrial markets. I.C.I.'s fine annual figures, in conjunction with more additions to the list of increased dividends, have helped also to keep the price averages around their new all-time peaks. At the beginning of this week, the previous buoyancy was abruptly checked by the foreign political uncertainties. Prices reacted from their recent best levels, and markets took on a more subdued atmosphere. Substantial improvements remained, in most cases, upon the prices that ruled early in April.

Higher Prices

A rise of 6s in the price of Reyrolles was among the outstanding market performances of the past few weeks. It was attributed to further consideration of the position revealed in the annual accounts. On similar grounds, C. A. Parsons rose 2s 6d, and several other shares reflected positive satisfaction with recent dividend and profits announcements: these included Lancashire Dynamos (4s 3d up over three weeks), Henley's, Sturtevant and Mather & Platt. A.E.I. and English Electrics both show gains of 3s or more. R. A. Lister at 40s are 4s 3d up. Babcocks and Metal Industries rose by 5s 9d and 4s 9d respectively. In a long string of other improvements, mention may be made of those affecting Automatic Telephone, Electric Construction, Ekco, British Thermostat, International Combustion, Morphy-Richards and B.E.T., all of which were at least 2s 6d to the good.

T.C. & M. Capital

In the chairman's statement accompanying the annual report of the Telegraph Construction and Maintenance Co. shareholders are advised that an issue of preference shares is under consideration. Need for fresh capital arises from the increasing activities of the group. An addition of preference shares to the company's capital structure would be an innovation, for the whole of the present amount in issue consists of the 1,954,100 ordinary shares of £1 each. The latter were quoted at 33s xd after the appearance of the full accounts. These disclose that turnover during 1953 increased by 8 per cent. Because of keener competition, trading profits of the group came out slightly below the

Three Weeks' Price Changes

Company or Board	Nom. Value	Middle price 26th Apr.	Three Weeks' Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	91	+1	3	3	3 6 0	90 8/16	88 7/8
Brit. Elec. 1974/77	100	90½	+½	3	3	3 6 4	90	87½
Brit. Elec. 1976/79	100	96xd		3½	3½	3 13 0	97	93 11/16
Brit. Elec. 1974/79	100	105		4¼	4¼	4 1 0	105½	103 5/16
Overseas Electric Supply								
Calcutta Elec.	£1	20/-		6†	6†	6 0 0†	20/7	18/7
East African Power	£1	23/-	+6d	7	7	6 1 9	23/4	20/7
Nigerian Elec.	£1	23/6		10	10	8 10 3	25/-	23/6
Palestine Elec. "A"	£1	19/-	+6d	Nil	N	Nil	20/-	16/-
Perak Hydro-Elec.	£1	14/6	−3d	Nil		8 5 6	15/6	13/9
Equipment and Manufacturing								
Aberdare Cables	5/-	9/9	+6d	25	12½*	7 2 9	8/10	8/1
Aerialite	1/-	11/3		88⅛	88⅛	7 17 0	12/1	10/10
Allen, W. H.	£1	58/-	+1/-	15	15	5 3 5	58/3	50/-
Aron Elec. Ord.	£1	45/-		15	20	8 17 9	46/6	43/-
Assoc. Elec. Ord.	£1	48/6	+3/-	20	11¼*	4 12 9	46/6	41/6
Automatic Tel. & El.	£1	68/9	+2/6	15	15	4 7 3	67/6	62/9
Babcock & Wilcox	£1	57/-	+5/9	18	18	—	51/3	47/3
Baldwin, H. J.	2/-	4/-	−6d	20	20	10 0 0	5/6	3/9
Bakelite	10/-	25/9	+9d	12½	12½	4 17 0	27/6	23/6
British Aluminium	£1	36/3xd		12	10	5 10 3	40/-	35/6
B.I. Callender's	£1	42/3xd		10	10	4 14 9	44/-	37/9
B.I. Callender's 6% Pref. ...	£1	26/-		6	6	4 12 3	26/-	24/3
British Thermostat	5/-	22/6	+2/6	30	35	—	21/6	17/6
British Vac. Cleaner	5/-	11/6	−1/9	25	25	10 17 6	14/6	12/1
Brook Motors	10/	36/6xd		20	20*	5 9 6	36/6	33/3
Brush Ord.	5/-	6/9		4	6	4 9 0	7/-	3/6
Bulgin, A. F.	1/-	3/3		30	30	9 4 6	3/7	3/2
Burco	5/-	13/9	+3d	35	35	6 7 3*	13/6	12/1
Chloride El. Storage	£1	54/6	−9d	20	12½*	4 11 9	57/9	46/6
Clarke Chapman	£1	75/9		17½	20	5 6 8	77/6	71/3
Cole, E. K.	5/-	27/-	+4/-	25	25*	4 12 7	25/9	22/6
Cossor, A. C.	5/-	8/-		10	10	6 5 0	8/11	7/-
Crabtree	10/-	25/9		17½	17½	6 16 0	27/9	23/9
Crompton Parkinson Ord. ...	5/-	16/6	+6d	11¼	20	6 1 3	16/2	14/-
De La Rue	5/-	13/-	−9d	35	Nil	Nil	14/10	12/3
Decca	4/-	35/6xd		150	35*	—	37/10	28/9
Desoutter	5/-	18/3		18	20	5 9 6	18/7	16/1
Dewhurst	2/-	5/6		19	19	6 18 3	6/3	5/1
Dictograph Tel.	2/-	6/-	+3d	20	20*	6 13 4	6/3	5/2
Dubilier Condenser	1/-	5/-		28	25*	5 0 0	5/1	4/1
E.M.I.	10/-	14/-	+6d	12	8	5 14 4	14/9	11/3
Electrical Components	5/-	11/3		20	20	8 17 10	11/6	10/9
Elec. Construction	£1	58/9	+2/6	15	15	5 2 3	57/-	53/-
Enfield Cable Ord.	£1	20/-	+1/3	7½	5	5 0 0	22/3	16/6
English Electric	£1	43/9	+3/9	15	10*	4 11 4	44/6	38/-
English Electric 3¾% Pref. ...	£1	16/6	+1/-	3¾	3¾	4 11 0	16/-	15/3
Ericsson Tel.	5/-	24/3xr		22†	25†	2 11 6*†	24/10	22/9
Ever Ready	5/-	32/6	+3/6	35	40	6 3 0	29/6	26/-
Falk Stadelmann	£1	40/-		15	15	7 10 0	41/-	36/6
G.E.C. Ord.	£1	42/6	+1/9	22½	11¼*	5 6 0	43/9	37/6
G.E.C. 6⅛% Pref.	£1	27/-		6½	6½	4 16 3	27/3	26/6
General Cables	5/-	16/9		30	30	8 19 2	16/10	16/6
Greenwood & Batley	£1	43/9		15	17½	8 0 0	44/-	40/3
Hackbridge Cable	5/-	13/6		20	20	7 8 3	13/6	11/3
Hackbridge & Hewittic	5/-	19/3	+6d	20	20	5 4 0	19/6	16/10
Hall Tel. Acc.	10/-	11/-	−6d	10	10	9 1 9	11/11	10/7
Heatrae	2/-	4/3	+3d	12½	12½	5 17 9	4/3	4/-
Henley's	10/-	18/-xd	+2/-	10½	10½	5 16 9	18/3	15/6
Holophane	5/-	14/9		20	20	6 15 7	15/-	13/1

* After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List

previous year's figure. Smaller tax charges, however, left an improvement of some 12 per cent in the net surplus at £223,000, which covers comfortably the amount involved in distributing the 8½ per cent dividend.

Siemens Brothers

Major importance is attached in the Telegraph Construction Company's report to the position of the half-owned Submarine Cables Company, which is engaged on the transatlantic telephone project. Annual results of Siemens Bros., the other partner in that undertaking, appeared on the last occasion towards the end of May. The price of the shares has recently risen by 6s 3d to 43s 9d. Siemens have made distributions totalling 10 per cent for three years past, the latest being paid from earnings equivalent to 24 per cent on the £3,675,000 ordinary capital. In front of this is £1,555,000 in preference stocks. Last year's accounts showed a rise in the figure for stocks and work in hand to over £9½ million, and, on the other side, an overdraft of more than £2 million. Cash stood at £290,000 and the surplus of current assets over liabilities was of the order of £8·1 million. The report mentioned capital expenditure projects on a record scale, and also satisfactory trading results at the half-way stage in the year for which the accounts are now awaited.

in Electrical Investments

Company or Board	Nom. Value	Middle 26th Apr	Three Weeks' Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1954 Highest	1954 Lowest
Equipment and Manufacturing—continued.								
Hoover	5/-	31/6	−2/9	25	45	7 2 9	34/3	26/3
I.C.I	£1	60/3	+2/-	13	15	4 19 6	59/-	52/9
Ind. Combustion	5/-	22/6	+3/-	15	20	4 9 0	20/4	14/6
Johnson & Phillips	£1	53/6	+1/6	15	15	5 12 3	52/3	48/9
Lancashire Dynamo	£1	50/9xd	+4/3	12½	14	5 10 3	49/6	43/-
Laurence, Scott	5/-	18/9	+2/-	15	20	5 6 8	16/9	14/-
Lister, R. A.	£1	40/-	+4/3	9	12	6 0 0	37/-	31/9
London Elec. Wire	£1	43/9	+2/3	12½	15	3 8 9°	43/6	38/-
Lucas, J.	£1	61/3xd	−2/6	9⅛	10⅝	3 10 9	64/4	50/3
Marryat & Scott	2/-	6/6		22½	22½	6 18 6	6/6	5/11
Mather & Platt	£1	64/-	+3/-	12½	15	4 13 9	61/9	53/1
Metal Industries	£1	35/-	+4/9	15	12°	6 17 3	42/3	29/6
Midland Elec. Mfg.	£1	63/9	+6d	15	15	4 14 0	65/7	63/-
Morphy-Richards	4/-	17/-	+2/6	40	40	—	15/9	11/4
Murex	£1	56/3	+2/3	15	15	5 6 9	54/6	50/-
Newman Ind.	2/-	2/3		10	10	8 17 9	2/6	2/-
Oldham & Son	1/-	3/-	+3d	35	17½°	5 16 8	3/4	2/5
Parnall (Yate)	5/-	6/-	−3d	6	8	6 13 4	6/6	4/3
Parsons, C. A.	£1	46/3	+2/6	12½	7½	3 4 9	45/6	38/1
Plessey	5/-	50/6	−9d	25	30	2 19 6	53/-	37/10
Pye Deferred	5/-	22/6	−1/-	18	20	—	24/-	15/7
Revo	10/-	17/6		27½	27½	—	17/9	16/7
Reyrolle	£1	80/-xd	+6/-	12½	13¾	3 8 9	76/9	66/-
Rheostatic	4/-	12/-		19	20	6 13 4	12/9	11/-
Richardsons Westgarth	5/-	12/3		12	15	6 2 6	12/3	8/7
Scottish Cable	4/-	14/6		32	20°	4 11 6	14/6	12/11
Siemens Ord.	£1	43/9	+6 3	10	10	5 6 8	38/9	34/9
Smith (England), S.	4/-	9/9		12½	15	—	9/11	7/8
Southern Areas	£1	18/-		5	6	6 13 4	18/6	17/6
Strand Elec.	5/-	8/3		17½	17½	10 12 3	9/3	8/6
Sturtevant	5/-	35/-xd	+1/9	18·1†	18·9°†	2 14 0†	34/9	29/-
Sun Elec.	£1	27/6		15	15	10 18 3	28/9	27/6
Switchgear & Cowans	5/-	12/6	+2/6	22½	10	4 0 0	13/7	9/9
Taylor Tunnicliff	5/-	11/-		25	12½°	5 13 9	12/4	10/7
T.C.C.	10/-	58/9	+13/9	20	30°	5 2 3	60/-	42/3
T.C. & M.	£1	33/-xd	+1/-	10	8½°	5 3 0	34/6	30/3
Telephone Mfg.	5/-	8/-	−6d	10	10	6 5 0	8/6	7/6
Thorn Elec.	5/-	17/-	−3d	12½	12½	3 11 5	17/6	13/3
Thornycroft	£1	36/3	+1/3	15	15	8 5 6	37/3	33/4
Tube Investments	£1	65/-		15°	15	4 12 4	68/9	60/3
Vactric	5/-	11/3	+1/9	Nil	Nil	Nil	11/3	7/6
Veritys	5/-	6/6		10	12½	9 12 3	8/3	5/-
Walsall Conduits	4/-	50/-		70	70°	5 12 0	50/-	44/-
Ward & Goldstone	5/-	46/3	+1/3	45	45°	4 17 3	46/-	41/3
Watford	2/-	6/3		25	22½°	—	6/3	4/7
Westinghouse Brake	£1	67/6		14	15	4 9 0	68/10	60/9
West, Allen	5/-	14/6		15	17½	6 0 9	15/3	12/7
Wolf Electric	5/-	12/6xd		15	17½	7 0 0	13/10	11/-
Trusts, Transport and Communications								
Anglo-Am. Tel.:								
A Ord.	100	82½	−3½	—	6	7 5 5	89½	82
Ord.	100	55½		—	3⅞	6 15 3	55½	52
Anglo-Portuguese	£1	22/6	+6d	8	8	7 2 2	23/4	21/-
Brit. Elec. Traction:								
Def. Ord.	5/-	45/-	+2/6	25	35	3 17 9	45/1	39/1
Cable & Wireless:								
Ord.	£1	40/6	+3/6	8	9	4 9 0	38/3	26/2
4% Loan	100	96½		4	4	4 3 0	98	95½
Calcutta Trams	£1	18/6xd	+1/-	6†	2½†	—	19/3	17/1
Cape Elec. Trams	£1	14/6		5½	5½	7 11 9	15/3	12/4
Marconi Marine	£1	30/-	+1/9	10	10	6 13 4	29/-	27/6
Oriental Tel. Ord.	£1	76/-	−3/-	16	16	—	80/6	74/3
Telephone Props.	£1	5		8	8	—	5 1/16	4½
Telephone Rentals	5/-	10/-	+6d	10	10°	—	9/10	9/1

Ever Ready Dividend

Ever Ready (Great Britain) 5s shares hardened further to 32s 6d (with dealings marked up to 33s 9d) after news of the increase in the dividend to a total of 40 per cent, and of the proposed one-for-two share bonus. They had previously risen, during the course of the past month, by some 5s in anticipation of good results, which, it may be judged, came well up to expectations. This decision restores the distribution to the rate paid regularly for many years up to 1949, since when it has been running at 35 per cent. The increase in the payment is well within the 17 per cent expansion in the net taxed profit to £407,000, from which dividends on the preference and ordinary stocks together take £233,000. That increase stands after a much larger tax charge, which includes £142,000 under the heading of the excess profits levy. On the new basis the shares yield a little over 6 per cent.

Company News

Laurence, Scott & Electromotors' 5s shares reacted well to the company's declaration of an increase in the dividend for 1953 from 15 to 17½ per cent, with the addition, as before, of a 2½ per cent cash bonus. The price was subsequently marked up to 18s 9d, making the yield, on the 20 per cent total distribution, nearly 5½ per cent. Going by the preliminary profits statement, the payment is covered three or four times by the available net surplus of earnings, which again advanced during the course of the past year. Veritys also announce a larger distribution, the 12½ per cent to be paid for 1953 comparing with the two previous years' payments of 10 and 7½ per cent. The 5s shares were subsequently called at 7s in the market (the official quotation remaining at 6s 6d). Both these companies paid material sums on account of the now defunct excess profits levy.

REPORTS and DIVIDENDS

The Telegraph Construction & Maintenance Co., Ltd.—The annual meeting will be held on 11th May. In his circulated statement, Lord Colgrain (chairman) says that the provision of further capital may become necessary. The directors are contemplating an issue of preference shares and shareholders will be circularized as soon as a decision has been reached. The power cable section of the Cables Division has suffered during the year through a general lack of orders due to the non-buying policy of the B.E.A., their largest customer. Referring to the manufacture of the transatlantic telephone cable by Submarine Cables, Ltd., jointly owned by Telcon and Siemens Bros. & Co., Ltd., Lord Colgrain says that the order book of Submarine Cables, Ltd., made expansion in its accommodation very necessary and this had been provided in a factory acquired at Erith. This factory will operate under the same system, and with the same administration, as has hitherto been carried out at Greenwich on behalf of Submarine Cables, Ltd.

With regard to the subsidiary companies, they envisaged a fall off in the demand for gutta percha, due to its replacement by modern plastics, and at the Selborne Plantation other crops, such as high yielding rubber, were being planted with the object of sharing the overhead costs of running the estate and so producing a reduced output of gutta percha economically. The factory at Wadville, Johannesburg, is expected to be in operation by the autumn. The joint venture with Johnson & Phillips, Ltd., at Chapelhall, near Motherwell, for the manufacture of a special strategic cable for the use of the Services, has had a successful trading result for the first period of 15 months ended 31st December last. The associated company Telcon-Magnetic Cores, Ltd., also at Chapelhall, has had a successful year.

Lancashire Dynamo Holdings, Ltd.—In his circulated statement, Mr. H. W. Bosworth (chairman) says that the figures for 1953 show little difference from those in the previous year; the turnover and percentage profit on turnover are practically the same. Dealing with the subsidiary companies, the chairman says that the Trafford Park works of Lancashire Dynamo & Crypto, Ltd., are fully occupied, and the works at Willesden also produced a high output, but towards the end of the year there was increasing difficulty in obtaining orders for small machines, largely owing to the difficulties now experienced in the export markets and keen Continental competition. There has also been some falling off in the Canadian trade. Foster Transformers had a successful year, but competition is now intense and orders are not easy to obtain, particularly from overseas markets. The Nevelin Electric Co., Ltd., Lancashire Dynamo Electronic Products, Ltd., and Crypton, Ltd., all had a successful year. Crypto, Ltd., which experienced difficulties in 1952 resulting in a loss for that year, made a satisfactory profit during 1953 as a result of considerable reorganization. A successful year has been experienced by Lancashire Dynamo South Africa (Pty.), Ltd. The manufacturing company has come into production, but at the moment the demand for electric motors in South Africa has decreased.

Elliott Brothers (London), Ltd., in their accounts for 1953 show a profit, before taxation, of £142,802, as compared with £108,726 for 1952, and a net profit of £124,802 (against £91,226). It is proposed to pay a dividend for the year of 20 per cent on £220,000 ordinary capital (against 15 per cent on £145,000 ordinary capital). General reserve receives £50,000, and £34,000 is transferred to tax equalization account. After crediting £10,000 E.P.L. provision not now required and £5,775 profit on sale of fixed assets, the balance carried forward is £109,367 (against £80,702 brought in).

The Ever Ready Co. (Great Britain), Ltd.—A profit of £1,076,992 is shown for the year ended 28th February, as compared with £847,625 for the preceding year. Taxation absorbs £670,185, leaving a net balance of £406,807 (against £348,263). It is proposed to pay a final ordinary dividend of 25 per cent (against 20 per cent), making 40 per cent for the year (35 per cent), and the dividend on the 7 per cent preference is maintained at the maximum of 10 per cent, with a final payment of 5 per cent.

It is proposed to capitalize £505,201 of reserves in paying up in full for ordinary stockholders one share of 5s (which will be converted into stock) for every two units of 5s held. It is also proposed to convert the 7 per cent cumulative participating preference stock into 10 per cent cumulative non-participating preference stock.

The Ever Ready Trust Co., Ltd., proposes to pay a final dividend of 9 per cent, making 15 per cent for the year ended 31st March last, as compared with 14 per cent for 1952–53.

Hopkinsons, Ltd., report that after charging £537,200 for taxation, the net profit for the year ended 31st January last is £392,632, as compared with £350,137 for 1952–53. Reserves receive £270,986 and it is proposed to pay a final dividend of 12½ per cent, making 20 per cent on £700,000 ordinary capital as increased by a 100 per cent scrip issue. This compares with 32½ per cent paid on the former capital for the previous year. The balance carried forward is £481,839 (against £715,446 brought in).

Mavor & Coulson, Ltd., report a profit for 1953 of £299,016, as compared with £278,279 for the preceding year, and after deducting £163,000 for taxation, there is a net balance of £136,016 (against £126,279). It is proposed to pay a final ordinary dividend of 10 per cent, making 20 per cent for the year (unchanged) on larger capital. The balance carried forward is £89,328 (against £35,870 brought in).

The Board proposes to apply to the Capital Issues Committee for permission to transfer £350,000 from reserve to capital account and to issue ordinary shares in the ratio of one for each share held.

The West London & Provincial Electric & General Trust, Ltd., reports a net income for the year ended 31st March last of £31,180 as compared with £26,222 for the previous year. It is proposed to pay a final ordinary dividend of 6 per cent (against 5 per cent) and a bonus of 2 per cent (same), making 12 per cent for the year (10 per cent). Reserve again receives £10,000 and £10,427 is carried forward (against £9,896 brought in).

Veritys, Ltd., in a preliminary statement, show a trading profit for 1953 of £69,988, as compared with £65,375 for 1952, and after deducting depreciation and £42,544 for taxation, there is a net balance of £17,085 (£16,465). It is proposed to pay a dividend of 10 per cent (against 7½ per cent), plus a bonus of 2½ per cent (same), making 12½ per cent for the year (against 10 per cent). The balance carried forward is £32,203 (against £27,493 brought in).

McMichael Radio, Ltd., reports a net profit for 1953, after all charges, including £52,300 for taxation, of £28,529 (against £24,273 for 1952). It is proposed to pay an ordinary dividend for the year of 12½ per cent (against 8 per cent).

The British Vacuum Cleaner & Engineering Co., Ltd., reports a net loss for the year ended 30th September last of £62,552, as compared with a profit of £117,633 for 1952. After making various adjustments, it is proposed to pay an ordinary dividend for the year of 25 per cent (unchanged), and to carry forward £50,044 (against £91,618 brought in). The directors state that the trading conditions in the early part of the year were abnormal and exceptionally adverse. These conditions substantially improved during the latter part of the year and the improvement has since been maintained. In view of this they feel justified in recommending the payment of the usual dividend.

Glenfield & Kennedy, Ltd., report a consolidated net profit for 1953 of £426,768, as compared with £291,866 for 1952, after providing £895,565 for

taxation and £61,824 supplementary depreciation. Reserves receive £150,000 and it is proposed to pay a final ordinary dividend of 12 per cent, making 17 per cent for the year (against 15 per cent). The balance carried forward is £88,250 (against £87,509 brought in).

Laurence, Scott & Electromotors, Ltd.—After allowing £364,000 for taxation, the net profit for 1953 is £188,286, as compared with £185,313 for 1952. It is proposed to pay a dividend of 17½ per cent and a bonus of 2½ per cent on the "A" and "B" ordinary capital. In June last £40,100 new "A" ordinary capital was issued at par. For the previous year the distribution was 15 per cent.

Parnall (Yate), Ltd., reports a group trading profit for 1953 of £193,194, as compared with £37,994 for 1952, and after providing £47,096 for taxation the net profit is £91,946 (against a loss of £189). It is proposed to pay a dividend for the year of 8 per cent (against 6 per cent), and after adding £6,430 unrequired tax, and £2,660 unrequired deferred repairs, and placing £34,856 to contingencies reserve, the balance carried forward is £288,813 (against £256,349 brought in).

The Rawlplug Co., Ltd.—The net profit of the parent company for 1953 is £258,600, as compared with £234,137 for 1952. It is proposed to pay a final dividend of 45 per cent (including a bonus of 5 per cent), making 60 per cent for the year (against 55 per cent). It is also proposed to make a 100 per cent free scrip issue, by the capitalization of £100,000 of reserves and the balance carried forward, and to issue one share for every ordinary share held.

Radio Rentals, Ltd., announces that it intends to lay before shareholders proposals for the reorganization of the capital structure of the group so as to eliminate the redemption rights of the preference shares of the company and of certain of its subsidiaries. Its main proposals are:—(a) That the redemption rights at present attached to the 5½ per cent redeemable cumulative preference shares of the parent company be cancelled and as compensation 18,750 5½ per cent cumulative preference shares of £1 each be allotted credited as fully paid up by way of capitalization of reserves to the holders of the redeemable preference shares in the proportion of one new share for every eight shares held. (b) That 245,000 5½ per cent redeemable cumulative preference shares of £1 each in certain subsidiary companies which are at present held by institutional investors will be purchased by the company and 281,750 5½ per cent cumulative preference shares in the company will be allotted to the institutional investors. (c) That 498,751 ordinary shares of 5s each be allotted credited as fully paid up by way of capitalization of reserves to the holders of ordinary shares in the proportion of one new share for every two ordinary shares held. The necessary class and extraordinary general meetings to consider the proposals will be held on 1st June.

The Ebonite Container Co., Ltd., has declared an interim dividend of 5 per cent (against 4½ per cent), on increased capital.

New Companies

Belco London, Ltd.—Registered 1st April. Capital £25,000. Wholesale factors, agents for and dealers in electrical apparatus, appliances, etc. Directors: R. Ellis and D. Winter. Regd. Office: 65, Buckingham Gate, S.W.1.

This is a company reconstruction following on the retirement of Mr. E. May.

S. & B. Electronics, Ltd.—Registered 11th March. Capital £100. Manufacturers, designers and repairers of and dealers in electrical and mechanical apparatus, etc. M. Sands signs as director. Regd. office: 185, Wardour Street, W.1.

F. Gray (North Shields), Ltd.—Registered 25th March. Capital £1,000. Electricians, mechanical engineers, manufacturers of and dealers in electrical apparatus and goods, etc. Directors: F. Gray and Isabel Gray. Regd. office: 73, Church Way, North Shields.

W.B. Electrical & Plumbing Engineers, Ltd.—Registered 23rd March. Capital £1,000. To acquire the business of electrical engineers and plumbers carried on at Vicarage Road, Marsworth, Tring, Herts, as W. B. Electrical Engineers, etc. Directors: N. J. Ward, Mrs. Patricia M. Ward, and E. J. Stone. Secretary: E. J. Dodman. Regd. office: Dundale Road, Tring, Herts.

Fieldson's Service, Ltd.—Registered 2nd April. Capital £2,000. Dealers in and retailers, wholesalers, manufacturers, importers and exporters of electrical goods of all kinds, including radio and television equipment, etc. Directors: H. M. Davies and E. A. Wilkinson. Regd. office: 307, High Road, Willesden, N.W.10.

F. K. Smith, Ltd.—Registered 3rd April. Capital £10,000. Electricians, electrical contractors and engineers, mechanical and radio engineers, etc. Directors: F. K. Smith and H. A. Smith. Regd. office: 92/4, Whitechapel, Liverpool.

Walter Miles (Electrical Engineers), Ltd.—Registered 6th April. Capital £3,000. Directors: W. G. Miles and Elsie Miles. Regd. office: 1, Halford Street, Leicester.

Richardson & Freeman, Ltd.—Registered 6th April. Capital £1,000. Service engineers of domestic, household and general electrical and other equipment and appliances, including washing and cleaning machines, refrigerators, etc. Directors: W. A. Freeman, L. J. Richardson, L. W. Richardson and Ivy M. Robertson. Regd. office: Central Buildings, 13, Glasshouse Street, Nottingham.

Increases of Capital

Partridge Wilson & Co., Ltd.—Increased by £125,000, in 50,000 preference shares of £1 and 300,000 ordinary shares of 5s each, beyond the registered capital of £25,000.

British Electric Resistance Co., Ltd.—Increased by £50,000, in 500,000 ordinary shares of 2s, beyond the registered capital of £50,000.

Liquidations

Clyde Electric Installations (Manchester), Ltd.—Members' voluntary winding-up. Meeting of members on 17th May at 1, Cooper Street, Manchester, 2, to receive an account of the winding-up by the liquidator, Mr. W. F. Riding.

Burrells (Leeds), Ltd., radio, television and electrical dealers.—Winding up voluntarily. Liquidator, Mr. P. H. Dobson, Permanent House, The Headrow, Leeds, 1, appointed 15th April.

Bankruptcies

C. G. Clews, 226, Stafford Street, Walsall, trading as Clews Electrical Co., electrical contractors, and as Clews Wee Bus, coach proprietor.—Application for discharge to be heard on 20th May at the Court House, Lichfield Street, Walsall.

H. Pryor, carrying on business as W. Pryor at 36, Low Hill, Liverpool, 6, electronic engineer.—Trustee, Mr. S. O. Henry, 5, Rumford Place, Chapel Street, Liverpool, 3, appointed 20th April.

D. L. Smith, lately residing and carrying on business at Midland Bank Chambers, Cefn Road, Old Colwyn, Denbigh, electrical engineer.—Last day for receiving proofs for dividend 7th May. Trustee, Mr. R. P. Booth, 5, Rumford Place, Liverpool, 3.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 7th May:—

RAY-O-VAC (design). Nos. 718,526 and 718,528, Class 9. Electric dry cells, dry cell batteries and cases for electric pocket lamps and for electric torches. RAY-O-VAC (design). Nos. 718,527 and 718,529, Class 11. Electric torches.—Ray-O-Vac Co., Madison, Wisconsin, U.S.A. Address for service, c/o Gill, Jennings & Every, 51–52, Chancery Lane, London, W.C.2.

BROMAR. No. 722,763, Class 9. Electrically operated devices for giving warning of defects in vehicle lighting systems.—J. Bromley and J. R. G. Marshall, trading in co-partnership, 150, Medway Road, Gillingham, Kent.

RANA. No. 719,202, Class 9. Radio transmitting and receiving apparatus, surveying and navigating apparatus and instruments, telephonic apparatus and instruments, etc., and electric cables and insulated electric wire.—E. L. G. Torcheux and E. A. H. Honore, trading in co-partnership, Paris, France. Address for service, c/o Marks & Clerk, 57–58, Lincoln's Inn Fields, London, W.C.2.

METLOHM. No. B722,870, Class 9. Electric resistors.—Painton & Co., Ltd., Bembridge Drive, Kingsthorpe, Northampton.

TENAPLAS. No. 725,402, Class 9. Electrical apparatus and instruments included in Class 9.—Tenaplas, Ltd., Upper Basildon, near Pangbourne, Berks.

SANGAMO WESTON (design). No. 725,638, Class 9. Scientific, nautical, surveying and electric apparatus and instruments, photographic, cinematographic, optical, measuring, signalling and checking (supervision) apparatus and instruments; and coin- or counter-freed apparatus.—Sangamo Weston, Ltd., Great Cambridge Road, Enfield, Middx.

NURAY. No. 726,126, Class 9. Electric transformers for use with cathode ray tubes.—A. Rose, trading as Direct T/V Replacements, 134–136, Lewisham Way, New Cross, London, S.E.14.

No. B723,720. Design, Class 11. Lighting apparatus and appliances.—Ashley Accessories, Ltd., Morecambe Road, Ulverston, Lancs.

FIREFLY. No. 726,163, Class 17. Asbestos, asbestos fibres, rovings, yarns, tape, tubing, etc.; electric insulating material, electric insulators, etc.—Turner Brothers Asbestos Co., Ltd., Asbestos House, 77–79, Fountain Street, Manchester, 2.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 9th June from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1948

22565/6. Sylvania Electric Products, Inc.—Automatic machines for making grid electrodes. 26th August, 1948. (710408/9.)

31957. Standard Telephones & Cables, Ltd.—Electronic switching system. 10th December, 1948. (710071.)

1949

13790. Ekco - Ensign Electric, Ltd., Haegele, F. G. A., and Stickley, W. A.—Electric-discharge lamps. 24th May, 1950. (710072.)

1950

20360. Telephone Manufacturing Co., Ltd.—Snap-action electric switches. 10th August, 1951. (710340.)

20625. Chamberlain & Hookham, Ltd., Deacon, L. O., and Lewis, H. S.—Electrically heated thermostatic means. 14th June, 1951. (710341.)

24950. Parmeko, Ltd., and Mee, S. N. S.—Electrical stop-motions. 10th October, 1951. (710255.)

25113. Bosch Ges., R.—Electrical recording apparatus. 14th October, 1950. (710411.)

27343. Standard Telephones & Cables, Ltd.—Electric telegraph systems. 2nd November, 1951. (710258.)

28067. Sunvic Controls, Ltd., Davis, N. R., and Wetherilt, J. N.—Electrical energy regulators. 7th November, 1951. (710259.)

29965. Foster Transformers & Switchgear, Ltd., and Jennings, R. E.—Automatic motor control apparatus. 7th December, 1951. (710178.)

1951

2698. Marconi's Wireless Telegraph Co., Ltd.—High-frequency filter, combiner and like arrangements. 30th October, 1951. (710345.)

4652. Hewittic Soc.—Electric impulse generator and control device utilizing such a generator. 26th February, 1951. (710181.)

6935. Jansen, B.—On-load change-over switch for tapped transformers. 22nd March, 1951. (710183.) 6938. On-load tap selector for tapped transformers. 22nd March, 1951. (710184.)

8050. Sunvic Controls, Ltd.—Electrical control or regulating systems. 27th March, 1952. (710350.)

8463. Hackbridge Cable Co., Ltd.—Arrangements for reducing the electrolytic corrosion in metal sheathed electric cables, metal pipes, conduits, and the like. 23rd June, 1952. (710100.)

9518. Philips Electrical Industries, Ltd.—Electric circuits for controlling d.c. motors during the starting period. 24th April, 1951. (710415.)

9666. Backer, C. B.—Tubular electric heating element and method of making same. 25th April, 1951. (710416.)

11229. General Electric Co., Ltd., and Bell, J.—Gas-filled electric discharge devices. 12th May, 1952. (710418.)

11231. M-O Valve Co., Ltd., and Bell, J.—Gas-filled thermionic valves. 12th May, 1952. (710419.)

12209. Sangamo Weston, Ltd.—Devices for testing electrical watt-hour meters or similar rotating systems. 24th May, 1951. (710351.)

18107. Dubilier Condenser Co. (1925), Ltd.—Electrical capacitors. 29th July, 1952. (710110.)

18517. Dunlop Rubber Co., Ltd.—Devices for limiting the temperatures of electrically heated elements. 4th July, 1952. (710363.)

18788. Metropolitan-Vickers Electrical Co., Ltd.—Magnetic induction accelerators. 9th August, 1951. (710421.)

18884. General Electric Co., Ltd., and Thompson, G. T.—Electrical attenuators. 11th August, 1952. (710189.)

18885. General Electric Co., Ltd.—Electrical attenuators. 11th August, 1952. (710112.)

19013. Morphy - Richards, Ltd.—Electric irons. 13th August, 1952. (710422.)

19469. Siemens & Halske Akt.-Ges.—Cathodes for electron tubes. 17th August, 1951. (710190.)

19580. Metropolitan-Vickers Electrical Co., Ltd.—Electrical rectifying circuits. 23rd July, 1952. (710276.)

20275. General Electric Co., Ltd., and Wilson, E.—Arrangements for mounting a trimmer capacitor on an inductance coil former. 22nd August, 1952. (710368.)

20767. National Research Development Corporation.—Electric arc welding apparatus. 3rd September, 1952. (710278.)

20965. British Thomson-Houston Co., Ltd.—Methods of measuring thickness or density of thin sheets. 5th September, 1951. (710124.)

21174. General Electric Co., Ltd., and Derrington, J. G. F.—Control apparatus for electric motors and winding equipment. 29th August, 1952. (710370.)

21752. Holophane, Ltd. (Holophane Co., Inc.).—Lighting systems and luminaires and refractors for use therein. 17th September 1951. (710127.)

22169. Morphy - Richards, Ltd.—Electric irons and other electrically heated devices. 22nd September, 1952. (710372.)

22928. British Thomson-Houston Co., Ltd.—Combustion chambers. 2nd October, 1951. (710287.)

24452. Standard Telephones & Cables, Ltd.—Multi-contact relay. 19th October, 1951. (710291.)

24468. Lancashire Dynamo & Crypto, Ltd.—Lubrication of anti-friction bearings. 20th October, 1952. (710292.)

24702. Gilfillan Bros., Inc.—Radar system and methods. 23rd October, 1951. (710295.) 26908. — Wide-band signal transmission. 16th November, 1951. (710298.)

25005. General Electric Co., Ltd., and Garthwaite, F. N.—End-pieces for chassis for mounting electrical apparatus. 22nd August, 1952. (710296.)

25078. Westinghouse Electric International Co.—Electroplating. 26th October, 1951. (710375.)

28886. British Thomson-Houston Co., Ltd.—Measurement of r.f. power. 27th November, 1952. (710378.)

29312. Wingrove & Rogers, Ltd., and Rogers, W.—Variable electric condensers or capacitors. 15th December, 1952. (710444.)

1952

2121. General Electric Co., Ltd., Brandreth, R. D., Garthwaite, F. N., and Wilson, E.—Radio receivers. 26th January, 1953. (710448.)

2276. British Thomson-Houston Co., Ltd.—Electronic amplifiers. 22nd January, 1953. (710380.)

2401. Stensholms Fabriks Aktiebolag.—Electric power regulators, particularly for electric heating apparatus. 29th January, 1952. (710152.)

2731. Westinghouse Electric Internationa Co.—Vapour-electric arc discharge devices 1st February, 1952. (710154.)

2983. General Electric Co., Ltd., and Altree, B. T. R.—Electric signalling devices. 2nd December, 1952. (710156.)

3041. Telefonaktiebolaget L. M. Ericsson.—Apparatus for the multiplication of two factors by electrical means. 5th February, 1952. (710199.)

4114. Diamond H. Switches, Ltd. (Boardman, R. H.).—Electric switches. 15th February, 1952. (710452.)

4499. Philips Electrical Industries, Ltd.—Carrier-wave telephone systems. 20th February, 1952. (710205.)

4751. Telefonaktiebolaget L. M. Ericsson.—Automatic telephone systems. 22nd February, 1952. (710161.)

4771. Sperry Corporation.—Magnetic amplifiers. 22nd February, 1952. (710382.)

4923. British Insulated Callender's Cables, Ltd.—Manufacture of plastic tubing. 24th February, 1953. (710453.)

6748. Siemens & Halske Akt.-Ges.—Frequency shift telegraphy. 14th March, 1952. (710384.)

7900. Hairy, R. E.—Means for suppressing arcs in electric switchgear. 27th March, 1952. (710386.)

10496. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Electron discharge tube apparatus for storing electrical signals. 25th April, 1952. (710212.)

11683. Metropolitan-Vickers Electrical Co., Ltd.—Cyclotrons. 8th May, 1952. (710313.)

12965. Ateliers de Constructions Electriques de Charleroi.—Variable frequency ultrasonic transducer. 22nd May, 1952. (710390.)

18588. Vossloh-Werke Ges.—Mounting fittings for tubular electric discharge lamps, such as fluorescent lamps or fluorescent tubes. 23rd July, 1952. (710320.)

19396. Baermann, M.—Electrical meters and the like measuring instruments. 31st July, 1952. (710231.)

20054. Eisler, P., and Hauser, E.—Printed electric circuits and electric circuit components. 16th July, 1953. (710235.)

21023. Duss, F. (trading as Duss Maschinenfabrik, F.).—Electric hand drilling and like tools. 21st August, 1952. (710239.)

21446. Hoover, Ltd.—Suction cleaners. 26th August, 1952. (710241.)

22095. British Thomson-Houston Co., Ltd.—Apparatus for measuring the d.c. output of multi-phase rectifiers. 2nd September, 1952. (710242.)

23334. Radio Corporation of America.—Television colour synchronization. 17th September, 1952. (710243.)

24439. British Thomson-Houston Co., Ltd.—Sealing of electric conductors through tubular bodies. 15th September, 1953. (710322.)

24846. Standard Telephones & Cables, Ltd. (Federal Telecommunication Laboratories, Inc.).—Electronic switching devices. 3rd October, 1952. (710403.)

25470. Belling & Lee, Ltd.—Electrical socket contacts. 10th October, 1952. (710404.)

25678. Westinghouse Electric International Co.—Fans. 14th October, 1952. (710405.)

26248. Philips Electrical Industries, Ltd.—Active getter material. 20th October, 1952. (710247.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Amble (Northumberland).—5th May. U.D.C. Electrical installations in 14 houses and two bungalows on the Links estate. Surveyor, Council Offices.

Australia. — BRISBANE. — 9th June. State Electricity Commission of Queensland. Transformers for the Townsville Regional Electricity Board. (E.S.B. 10378/54. Ten/9052.)*

16th June. City Council. Four 11 kV switchboards. (E.S.B. 10379/54. Ten/9059.)*

9th July. E.h.v. tongue and clevis disc insulators, l.v. shackle insulators, reel insulators and l.v. rack insulators. (E.S.B. 10007/54. Ten/8997/.)*

Belfast.—14th May. Electricity Department. Portable fire-fighting appliances. 28th May. Lighting and heating installations at power station. (See this issue.)

Canada.—WINNIPEG.—City Hydro-Electric System. Two 4,000 kVA transformers. (C.R.E. 5153/54. Ten/9034.)*

Formosa. — TAIPEI. — 24th May. Central Trust of China. Voltage regulators, voltmeters, laminated switches, safety switches and fuse link. (E.S.B. 10377/54. Ten/9056.)*

India. — NEW DELHI. — 21st May. Directorate General of Supplies and Disposals. 1,000 miles of twisted t.r.s. telephone cables. (E.S.B. 10029/54. Ten/9011.)*

Iraq.—BAGDAD.—31st May. Directorate General of Municipalities. One 50 kW generating set. (E.S.B. 10075/54. Ten/9035.)*

Longbenton. — 17th May. U.D.C. Electrical installations in 78 houses. (See this issue.)

Manchester. — 19th May. City Council. Posts and diffusion globes for traffic islands. (See this issue.)

Mitcham.—29th May. Corporation. Street lighting equipment. (See this issue.)

New Zealand. — WELLINGTON. — 1st June. Director-General, Stores Division, Post and Telegraph Department. Headphones, cords and insulators. (E.S.B. 9787/54. Ten/8993.)*

South Africa.—CAPE TOWN.—14th May. Provincial Administration, Cape of Good Hope. Electro-medical apparatus. (E.S.B. 9942/54. Ten/8986.)*

JOHANNESBURG.—19th May. S.A. Railways. Telephone cable. (E.S.B. 10419/54. Ten/9069.)* Electricity cable. (E.S.B. 10161/54. Ten/9040 and E.S.B. 10162/54. Ten/9028.)* Radio equipment. (E.S.B. 10163/54. Ten/9027.)* Radio valves. (E.S.B. 10429/54. Ten/9061.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Uruguay. — MONTEVIDEO. — 24th May. Ministerio de Salud Pub'ica. X-ray accessories. (E.S.B. 10299/54. Ten/9049.)*

25th May. Administracion Nacional de Combustibles Alcohol y Portland. Circuit breaker. (E.S.B. 10361/54. Ten/9046.)*

ORDERS PLACED

Barnsley. — Corporation. Electrical installation at first instalment of extensions to the Mining and Technical College £14,272).—Pinching & Walton.

Croydon.—South West Metropolitan Regional Hospital Board. Re-wiring at the Mayday Hospital (£4,479).—William Steward & Co.

Leek (Staffs).—Birmingham Regional Hospital Board. Recommended. Rewiring work at St. Edward's Hospital, Cheddleton (£3,383).—Tomlin's.

London.—L.C.C. Electric passenger lift and two electric school meals service lifts at the proposed comprehensive high school, Putney Park Lane, Wandsworth (£3,327).—Bennie Lifts, Ltd. Renewal and improvement of electrical installation at the Central London Women's Institute, Bolt Court, E.C.4 (£3,083).—Alexander Hawkins & Sons, Ltd. Wiring and fittings for electric lighting, etc., Barnaby Buildings, Bermondsey, and Denham Buildings, Battersea (£2,636).—Haines & Sheppard, Ltd.

Seaham (Durham).—U.D.C. Electrical installations in 120 new houses and 30 bungalows.—J. Calvert.

Stockton-on-Tees. — Corporation. Electrical work in seven shops and five flats (£559).—Stewart & Son.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alston.—Nineteen houses and eight flats for R.D.C.; Graham & Roy, architects, 6, Paternoster Row, Carlisle.

Basingstoke. — Factory, Winchester Street, Overton; E. Carter, Ltd., 69, Eastgate, Winchester.

Birkenhead.—Works extensions; L. Ellis & Co., Ltd., ship furnishers, Albion Works.

Extensions to Odyssey Works, Corporation Road, for Alfred Holt & Co., Ltd.; Gornall, Kelly & Partners, architects, 69, The Albany, Liverpool.

Houses (150), Manor Drive; Upton Estates, Ltd., 6a, The Temple, Dale Street, Liverpool, 2.

Birmingham. — Additions to St. Philip's Grammar School, Hagley Road, blocks of flats for single women, large building for living accommodation and surgeries for doctors in the Duddeston-Nechells area, and 315 dwellings on the Wyrley Birch estate, Perry Barr; city architect, Civic Centre.

Boscombe. — Flats (76), Tweedale Road; A. E. Adams, Ltd., 27/29, Ashley Road.

Bradford.—Works offices in Bolton Lane; Metaltreat, Ltd., galvanizers, etc., 359, Canal Road.

Bullingdon.—Houses (50), Forest Hill; R.D.C. surveyor, 76, Banbury Road, Oxford.

Burnley.—Dwellings (594), Bee Hole estate; borough engineer.

Carlisle.—Civic centre, Rickergate; city engineer, 18, Fisher Street.

Radiotherapy department at Cumberland Infirmary (£14,500); J. Millar & Son, builders, London Road, Carlisle.

Ophthalmic operating theatre at Cumberland Infirmary; J. T. Hart, quantity surveyor, Natproban Chambers, Carlisle.

Chelmsford.—Research and development building, Bishops Hall Lane; Hoffman Manufacturing Co., Ltd., New Street.

Machine shops; Windley Bros., Ltd., Crown Works, New London Road.

Chichester.—Additions and improvements to pumping station, Funtington (£33,700); R. A. J. Cork, borough surveyor, North Street.

Consett.—Memorial hall, John Street (£60,000); Fennell & Co., architects, Bridge End Chambers, Chester-le-Street, Co. Durham.

Coventry.—Houses (48), Henley Road; city architect.

Bakery and offices, Stonebridge Highway; Savages Bakeries, Ltd., Argyll Street.

Cranbrook (Kent).—Houses (34), Court Stile site; R.D.C. surveyor, Council Offices, Hill House.

Crowle.—First portion of secondary modern school (£13,000); county architect, Lincoln.

Doncaster.—Three-storey flats and 12 houses; borough architect.

Dudley.—Factory at Stourbridge Road for Wards (Stourbridge), Ltd.; Robinson & Kay, architects, High Street, Stourbridge.

Admission and casualty departments, Dudley Hospital; Birmingham Regional Hospital Board, 10, Augustus Road, Birmingham.

Eastbourne.—Housing estate, Ratton Wood; Lions Green Works, Ltd., builders, Horam.

Enfield. — Workshops and stores; Lubetkin Products, Ltd., Wharf Road, Ponders End.

Fareham.—Industrial premises; E. S. Perry, Ltd., pen manufacturers, Iridinoid Works, Bridgemary, Fareham.

Gateshead.—Factory, Team Valley Estate, for Albert Gill, Ltd.; Newrick & Blackbell, architects, John Street, Sunderland.

Central pavilion, Saltwell Park (£24,000); G. F. Winters, borough engineer.

Guisborough.—Infant welfare centre; county architect, County Hall, Northallerton.

Bungalows (17), Park Lane estate; U.D.C. surveyor.

Halesowen.—Proposed extensions to premises for J. H. Smith, Ltd., Vulcan Works, Banner Street; T. S. Beach, architect, Halesowen.

Hebburn-on-Tyne.—Cinema, Victoria Road, for Dawe Brothers, Westgate Road, Newcastle-on-Tyne; Stephenson & Gillis, architects, Saville Chambers, Newcastle-on-Tyne.

Community centre, Crawley Square; U.D.C. surveyor.

Hendon.—Offices and flats, Station Road; Talboys (Builders) Ltd., 758, Finchley Road, London, N.W.11.

Hereford.—Warehouse; Griffiths & Hartland, Ltd., corn merchants, Moorfields.

Hove.—School, West Blatchington, for County E.C.; East Sussex county architect, County Hall, Lewes.

Hull.—Occupation centre for mentally defective children on site at Leeds Road corner; W. Morris, city engineer.

Ilford.—R.C. church and hall, Padnall Road; O'Neill & Fordham, architects, 210, Springfield Road.

Beal Grammar-Technical School, Woodford Bridge Road; Hiscock & Duncan Scott, architects, Piccards House, Bridge Street, Guildford.

Houses (51), Marks Gate estate; A. E. Whichello, Ltd., builders, 150, St. Mary's Road.

Ince-in-Makerfield.—Glass bottle factory; C.W.S. Architects' Department, Balloon Street, Manchester.

Keighley.—Houses (62), Braithwaite estate; F. W. Heaton, Ltd., Oak Avenue, Bingley.

Kingswood.—Large modern factory at Wood Street, for Thomas & Evans, Ltd.; J. W. Mackintosh, architect, Tyndalls Park Road, Bristol.

Leicester.—Houses (136), Nether Hall estate; S. J. Smith & Co., Ltd., builders, Smith Road, Wednesbury.

Liverpool.—Factory and offices, Blundell Street and Kitchen Street; Hughes & Ellison, Ltd., 34, Slater Street.

Office block for Pearl Assurance Co., Ltd.; Sir A. E. Shennan, architects, 17, North John Street.

Residential hotel at Netherton for Greenall Whitley & Co., Ltd.; Gornall, Kelly & Shelton, architects, 69, The Albany.

London. — BALHAM. — Second stage development scheme, St. James's Hospital (£360,000); South West Metropolitan Regional Hospital Board, 11, Portland Place, W.1.

HAMMERSMITH.—Dwellings (80), Sulgrave Road; borough engineer.

HOLBORN.—Block of offices, shops, etc., at 251–256, Tottenham Court Road; Great Universal Stores, Ltd., Universal House, Swallow Place, W.1.

NORWOOD.—Technical College extensions (£70,000); W. J. Cearns, Ltd., builders, Carpenters Road, E.15.

STEPNEY. — Dwellings (141), Sidney Street; Sydney Clough, Son & Partner, architects, 39, Devonshire Street, W.1.

Ludlow (Salop).—Houses (300), Sheet Road; borough surveyor, Council Offices.

Manchester.—Extensions to Margaret Barclay Special School; city architect.

Matlock. — Offices, stores, etc., in Bakewell Road; North Western Road Car Co., Ltd., Causeway Lane, Matlock.

Merthyr Tydfil. — Houses (201), Gurnos, Merthyr and Troedyrhiw; borough surveyor, Town Hall.

Middlesbrough.—County secondary school (£155,482); F. Shepherd & Son, Ltd., contractors, York.

Newcastle - on - Tyne.—Secondary modern school, Blakelaw estate (£138,000); city architect, 18, Cloth Market.

Northallerton.—Primary school; J. H. Napper, 56, Elden Place, Newcastle-on-Tyne.

Oldbury.—Erection of Brandhall C.P. School; J. Harper & Sons (Blackheath), Ltd., Blackheath.

Ramsgate. — Additional factory premises; Craxfords (Ramsgate), Ltd., Ashburnham Road.

Rotherham.—Shopping centre, East Herringthorpe estate; borough engineer.

Runcorn.—Houses on estates at Penn Lane (66) and Windsor Grove (43) for U.D.C.; A. B. Cunningham, surveyor, Town Hall.

Salisbur .—Church, Bemerton Heath estate; N. F. Cachemaille-Day, architect, 1, Port Hill, Hertford.

Scarborough.—Further shops at Eastfield; H. V. Overfield, borough engineer.

Shrewsbury. — Houses (84), Meole Brace estate; borough surveyor, Guildhall.

Spalding.—Old people's houses, Stonegate; Council's architect, Council Offices.

Stanley.—Licensed premises at South Stanley for Vaux and Associated Breweries; E. M. Lawson, architect, Barras Buildings, Barras Bridge, Newcastle-on-Tyne.

Stores for F. W. Woolworth & Co. Ltd. (£30,000); company's Architects' Department, Liverpool.

Thames Ditton.—Five-storey block of flats in Aragon Avenue, for Esher U.D.C.; C. G. Alderton, surveyor, Council Offices, High Street, Esher, Surrey.

Wakefield.—New hotel at Eastmoor estate for Joshua Tetley & Son, Ltd., Leeds; Kitson, Ledgard & Pyman, architects, Lloyds Bank Chambers, Vicar Lane, Leeds.

Wallsend.—Factory and warehouse, Bewicke Road, for Houseman & Thompson, Ltd.; R. T. Smith, architect, 37, Glendale Avenue, North Shields.

Extension to factory, North Terrace, for Victor Products, Ltd.; own architects.

Walthamstow.—First stage of North Walthamstow Technical College; borough education architect.

Watford. — Extensions to works (£500,000); Sun Printers, Ltd., Whippendell Road.

Houses (50), Sheepcot Lane; F. C. Sage, borough surveyor, Town Hall.

West Bromwich.—Municipal offices, Highfields; borough surveyor.

NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E 1, to ascertain that proposed dates for their functions do not clash with others already arranged

Monday, 3rd May, to Friday, 14th May

LONDON AND BIRMINGHAM.—British Industries Fair.

Monday, 3rd May

BIRMINGHAM.—James Watt Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Centre. "Safety in the Use of Portable and Transportable Electrical Equipment in Industry," by J. W. Bunting.

Tuesday, 4th May

ELTHAM. — Congregational Church, Court Road, 8 p.m. A.S.E.E. South-East London Branch. "Tape Recording."

LEEDS.—1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Centre. Annual general meeting.

LONDON.—At the Institution of Electrical Engineers, Savoy Place, 5 p.m. Institution of Post Office Electrical Engineers, London Centre. "Short Wave Directional Aerial Systems," by D. W. Morris, W. G. Shaddick and E. W. Thurlow.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Centre. Annual general meeting. "Some Applications of the Electrolytic Tank to Engineering Design Problems," by H. Diggle and E. R. Hartill.

NEWCASTLE-UPON-TYNE.—City Hall, 7 p.m. I.E.E. North-Eastern Centre. Faraday Lecture on "Electro-Heat and Prosperity," by O. W. Humphreys.

Wednesday, 5th May

GLASGOW.—At the Institution of Engineers and Shipbuilders, 7 p.m. I.E.E. South-West Scotland Sub-Centre. Annual general meeting.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Radio Section. "The Reflection and Absorption of Radio Waves in the Ionosphere," by W. R. Piggott. "Some Notes on the Absorption of Radio Waves Reflected from the Ionosphere at Oblique Incidence," by Dr. W. J. G. Benyon.

John Adam Street, 2.30 p.m. Royal Society of Arts. "Colour Television," by Commander C. G. Mayer.

At the London School of Hygiene and Tropical Medicine, Keppel Street, 6.30 p.m. British Institution of Radio Engineers, London Section. "Microwave Measuring Equipment," by P. M. Ratcliffe.

PRESTON.—N.W.E.B., Friargate, 7.15 p.m. I.E.E. North Lancashire Sub-Centre. Annual general meeting, followed by "Continuity of Electricity Supply," by H. Leyburn.

Thursday, 6th May

CARDIFF.—Park Place, 6 p.m. South Wales Institute of Engineers. Paper on experiences in America, by the holders of E.C.A. scholarships.

GLASGOW.—Royal Technical College, 7 p.m. I.E.E. South-West Scotland Sub-Centre. Faraday Lecture: "Electro-Heat and Prosperity," by O. W. Humphreys.

LIVERPOOL. — Electricity Service Centre, Whitechapel, 7 p.m. British Institution of Radio Engineers, Merseyside Section. Annual general meeting followed by technical films.

LONDON.—Savoy Place, 5.30 p.m. Institution of Electrical Engineers. "Electric Traction Using Single-Phase 50 c/s Current," by M. Garreau. "Electric Locomotives on the Valenciennes-Thionville Line," by F. Nouvion.

Friday, 7th May

BRADFORD.—Victoria Hotel, Bridge Street. Bradford Engineering Society. Annual dinner.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. Institute of Fuel, South Wales Section. Annual general meeting and chairman's lecture.

Saturday, 8th May

EVESHAM.—I.E.E. South Midland Education Discussion Circle. Summer meeting. Visit to B.B.C. Engineering Training Department.

LEEDS.—1, Whitehall Road, 2.30 p.m. I.E.E. North Midland Students' Section. Annual general meeting.